

# FLIGHT

First Aero Weekly in the World.

Founder and Editor: STANLEY SPOONER.

A Journal devoted to the Interests, Practice and Progress of Aerial Locomotion and Transport.

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## Flight.

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## EDITORIAL COMMENT.

**Aerial Ascendancy in the West.**

It seems to be almost impossible to arrive at the truth about the condition of things in the air on the Western Front. Ever since the beginning of the present year the tongue of rumour has been busy regarding the "ascendancy of the air" and, on balance, report has had it that that ascendancy has definitely passed from us to the enemy. Our casualties in the R.F.C. have been very much above the normal, and compared with the official reports relating to German machines brought down and destroyed they appear to bear a disquieting proportion to those of the enemy. In Parliament, when Ministers are challenged to say what the position really is, questioners are met with evasions and, unfortunately, too often with statements that are demonstrably wrong. For example, it is only a few weeks ago that Sir Henry Dalziel asked the Under-Secretary for War if he could assure the House that we still retained the mastery of the air on the Western Front. The answer given was: "I think I can make that assurance." If Mr. Macpherson really believed he could give that assurance—and we must do him the bare justice to think he did—all we can say is that he cannot have taken much trouble to post himself in the facts of the case. Whether the

deliveries of fast, high-powered machines that have been made in the meantime have redressed the balance, we are not in a position to say, but we do assert this: that at the time the Under-Secretary was assuring the House that we still retained the mastery of the air in the West, the facts were all the other way, at least so far as one can judge from "stories" direct from the front, of fast German machines which hopelessly outclassed our own, machines that had ours beaten at every point save that of the skill and daring of the men who flew them. Machines that could climb a full 3,000 feet higher than our own and simply await the opportunity to dive down upon the slower and less handy British 'planes, with a consequent heavy casualty bill among our gallant fellows who were thus sent out with, figuratively, a bow and arrow to fight men with rifles. There is not a shadow of doubt that at this time the Germans were very definitely in the ascendant, and a week after the reply we have noted, Mr. Macpherson himself went a long step towards admitting it when he told the House that the mastery of the air was still "undecided."

Much as we must deplore the loss of many of our gallant flying men, who have lost their lives through flying against the enemy in obsolescent machines, we still must recognise that we cannot expect always to be in the immediate possession of better machines than the Germans. That is an aspect of the matter with which we have dealt before. Germany, like ourselves, is an engineering nation, and is just as likely as we are to be first in the field with improvements and discoveries which will have the effect of putting her temporarily in front in some detail of warlike equipment. Conversely, we must in the nature of things be sometimes in front of the enemy—neither can expect to have it all its own way every time. Therefore, we are not inclined to fall into a state of panic over this one aspect of the war in the air. It is inevitable that the fortunes of war should sway first to the one side and then to the other as this or that improvement becomes available to either side, and in witness whereof there is in the latest report of the *Daily Mail*, reference to our "latest aeroplane" and its bringing down five in one flight.

When we have considered and given due weight to these considerations, we next come to the inevitable question of whether everything is being done to keep our own Flying Services well abreast of every new development, and to provide them at the earliest possible moment with the very latest thing in machines and equipment? We are afraid that it is here that the principal weakness lies. After nearly three years



of war, and almost infinite permutations in the Air Services, we still hear of the resources of large factories being wasted in the production of machines that have been classed as obsolescent many months ago. We are told, on authority which appears unquestionable, of huge deliveries still being made of machines that are utterly useless for the purposes of the war—machines which are virtually “scrap” before they are even erected. And, as though to play the farce out to its conclusion, before they are finally relegated to “Rotten Row,” the valuable time of test pilots is wasted in putting these machines, which it is never seriously intended to use, through a series of acceptance tests! Could ineptitude be carried to greater lengths?

Assuming that these things are as they are stated to be—and we have the gravest reasons for believing they have some backing—it is full time that the people responsible, no matter who they may be, should be brought to book. We have pointed out in the pages of “FLIGHT” not once, but many times, that there is only one way in which we can keep in front of the enemy in this vital matter of “best” machines, and that is by ruthlessly scrapping our obsolete designs and cancelling out of hand all contracts for their construction. The moment it is decided that a certain machine is out of date, the knife ought to be put through every contract, even if the country has to pay for a thousand machines which have never been, and never will be, delivered. As a matter of fact, it would never come to that, but we take the extreme case in order to point the urgent necessity of the system we urge. The main thing is that not a single one of our factories should be allowed to waste a single hour on the production of machines that are useless for the purposes of war. It is here that the shoe pinches worst. There is very little question but that the “best” British aeroplane is superior to the best the Germans possess, but where the latter are at an advantage is in that they appear to have infused more of the business spirit into their constructive branch, and the beginning of the year has found them in effective possession of many more “best” machines than have been delivered to our air squadrons at the front.

## Is Our Training System Right?

Apart from the heavy casualty bill at the front, the Flying Services appear to be suffering too many losses in training—in fact, if the figures that reach us relative to these losses during the past few weeks approximate at all to the truth, they can only be described as appalling. Admitting that it is necessary that the peace time routine of training for pilots should be drastically modified, there are limits to the policy of speeding-up, and these should be set far short of the point at which they result in the killing of a proportion of pupils which, again assuming that the figures we have been given are approximately correct, hardly fall short of our average of losses at the front. Manifestly, there is something radically wrong with the new system, and it will have to be altered, and that without delay. To our way of thinking, to teach a pupil to fly on relatively slow and stable machines like the B.E. and then put him straight into one of the newest and fastest of the “Scouts” is simply asking for trouble. That, we are told, is the root cause of the large number of fatalities that have been recorded during the last few weeks.

It is not long since we drew attention to the fact that pilots who have been flying at the front for many months and have got used to the ways of the aerial Hun, are left to fly the older machines, while the new, fast ‘planes are flown by the newly-fledged men with no actual experience of fighting in the air. This again is a matter which affects the whole training system, and unhesitatingly we say that the system appears to be altogether wrong. At the one end it puts a totally inexperienced pilot into the seat of the fast machine, with the natural consequence that in too many cases he crashes a valuable craft and kills himself. At the other, it discounts the value of the trained and war-wise pilot who is given a machine to fly which will not bring him within a couple of thousand feet of the raiding Hun and pits the youngster in the fast ‘plane against the crack German flyers, with the certain result that our losses increase while the enemy’s show a falling tendency. We had hoped that with the advent of the new Air Board our aerial house in all directions would be set in order. So far as it is possible to discern, the only difference between the new regime and the old is that the new is housed in more palatial quarters and has increased the number of its army of petty officials. Certainly the muddle does not seem to have grown less.

## Parliament and the Air Muddle.

There is just one healthy sign of the times, and that is that an increasing number of members of the House appear to be taking an interest in aerial matters, and to want to know the why and wherefore of things. Mr. Pemberton Billing is no longer left to plough the lonely furrow of criticism. Speaking on the motion to adjourn for the Easter recess, Mr. Winston Churchill had some trenchant things to say regarding our aerial policy. He reviewed the whole story of the muddle in the Air Services since the beginning of the war, and was especially severe in his criticism of the House for having allowed control to pass out of its hands. Dealing with the institution of the Air Ministry, he said:—

“New arrangements were made, but still half-hearted, still imperfect, still vitiated by most serious flaws of administrative principle, and a new Minister was appointed to have a new and fair trial, and I am sorry to say he has been ill nearly ever since. What I may call the ‘Curzon’ period covered some months of vital consequence to the Air Service, and the results of that period are now manifesting themselves.

“We are told that our advantage in machines has passed very largely to the Germans. I cannot say where that is so, but we are told it is. I do not know how that may be, but I have heard from many quarters complaints to that effect. Certain I am of this, that the inferiority is not due to any defect in our pilots. There is no more daring class, no more enterprising, no more gifted class of flyers in the whole world than the heroic young men who represent us at the front. But it is freely stated that they are at a disadvantage at the present time in respect of some of their machines, and certainly the casualties have been terribly severe, and out of all proportions to their numbers, and I cannot feel satisfied that they are in proper proportion to the losses suffered by the enemy. But it is not only the question of casualties at the front, but the very large number of casualties that have taken place during training at the present time. Then there is the Royal Naval Air Service, which at present and for a long time past has given no adequate fighting return for the enormous number of pilots and the great proportion of material and skilled labour which it has gathered together, and which has been fettering enterprise.”

Mr. Bonar Law, who replied, cannot be said to have been convincing. After admitting that the present Air Ministry is a compromise, he denied that it had been a failure, even in the intermediate stages, and went on to say that there was a great difference in





DAWN?



the numbers and the efficiency of the machines and the men we have now compared with what they were at the end of the last campaign. It was quite true, he said, that we have not now the ascendancy we had at that time, and it was true also that the same thing was the case at the beginning of the campaign last year. All the same, he thought the House would be well advised to wait a little before coming to the conclusion that we may not again completely regain the ascendancy we had at the end of the last campaign. He would not say that we could. That depended not only on what we have done, but on what the enemy has done. We had made great improvements, and whether they were adequate or not events only could show. All this is perfectly true and we appreciate the frankness of it, but at the same time it does give point to the criticisms we have already voiced.

## A Great Battle in the Air.

A series of air battles, comparable to nothing that has happened in the previous months of the war, are disclosed in the official reports from the front covering the past week-end. In the bald phraseology of the *communiqués*, "our aeroplanes have been very active." How active we are shown by the results that fall to be reported. They continually harassed the enemy's communications far in the rear, seeking out his fighting machines at a considerable distance behind his lines. Large tracts of the enemy's country many miles in rear were photographed, over 1,700 photographs being taken behind the German lines. Co-operation with the artillery continued during daylight unhindered, although repeated attempts were made by the enemy to prevent this important work. Seventeen successful bomb raids were carried out on enemy aerodromes, ammunition depôts, and railways a long way behind the lines, in addition to numerous small raids. A total of over eight tons of bombs was dropped.

At the same time, intense fighting between large formations took place. Our casualties over this period were 28 machines missing, a large number of which are known to have been shot down in combat over the enemy's country. It is known that the enemy suffered very heavy casualties. In one case an observer was seen to fall out of his machine, which went down out of control in a spin, and in another the fighting was so close that the enemy pilot was seen to fall forward, his machine nose-diving out of control. Fifteen hostile machines were driven down and actually seen to crash, while 31 others were driven

down damaged, a very large proportion of which must have been totally destroyed.

That is the story as disclosed by Sir Douglas Haig's reports. The figures of our own casualties are heavy, but in relation to the results attained it cannot be held that they are too heavy to be warranted by the importance of the operations in which they were engaged. When we recollect, too, that the whole of these losses were sustained in operations of an offensive character and in the face of the desperate attempts of the enemy to keep our machines from attaining their objectives, we can only appreciate the outstanding fact that our aviators have done exceedingly well—brilliantly well—and at a relatively low cost. We must keep before us the fact that if we have suffered grievous loss, that loss has been more than balanced by the tale of German casualties. Moreover, it is apparent that in spite of the enemy's resistance and of the heavy list of casualties, our men have secured the ends for which they were launched on their enterprise. In a word, the results have been worth the sacrifices demanded of the R.F.C. We deplore the necessity for those sacrifices, but there is this much of comfort in it, that we know the sacrifice has been made willingly and ungrudgingly, and that when once more an equal tale of sacrifice is demanded it will again be rendered in the spirit of self-negation which has become a commonplace in our Flying Services.

The barest return that can be made to these gallant services is that they shall be given the needful machines and equipment to ensure that the sacrifices they are called upon every day to make shall be effective in the country's service. That that return has not been made hitherto is one of the capital scandals of the war. We are very much of the opinion of the *Daily Mail* when it says that if it is true that the Germans have a machine that can sit comfortably at a height of 18,000 feet, while most of ours are unable to get within 3,000 feet of it, then it is time for a prompt and stern enquiry to fix the blame upon the man who is responsible. It is time also for him to be punished in such a manner as shall set up in the command of the Flying Service the same high standard of duty as was established in the Navy by those who condemned Admiral Byng. That is strong language, but not a whit stronger than is warranted by the circumstances which have prompted it. Unless things are to be altered and the muddle properly straightened out, the country will be to the full justified in asking for the head of somebody on a charger—and in insisting on getting it.

## "X" AIRCRAFT RAIDS.

In view of the decision of the Government not to allow details of places visited by enemy aircraft to be published, we are, as before, giving to each one an index number. Eventually, when details are available, we shall give the respective information under these index numbers, which will facilitate easy reference to each particular raid.

### "X 58" Raid (April 5th).

THE following *communiqué* was issued by the Field-Marshal Commanding-in-Chief Home Forces at 12.25 p.m. on April 6th :—

### R.N.A.S. Attack on Zeebrugge.

THE following was issued by the Admiralty on April 8th :—  
"Vice-Admiral, Dover, reports: 'Attacks were carried out on Zeebrugge Mole by seaplanes of the Royal Naval Air

"A hostile aeroplane passed over certain Kentish Coast towns at about 10.45 last night. Eight bombs were dropped, most of which fell in the open. No casualties were caused, and no damage resulted beyond the breaking of some glass."

### German Version.

Berlin.

"During the night of April 5th a German waterplane squadron lavishly and successfully bombed vessels lying in the Downs and searchlights and fortifications north-west of Ramsgate.—Chief of Admiralty Staff."

Service on the night of the 7th-8th, and many bombs were dropped.

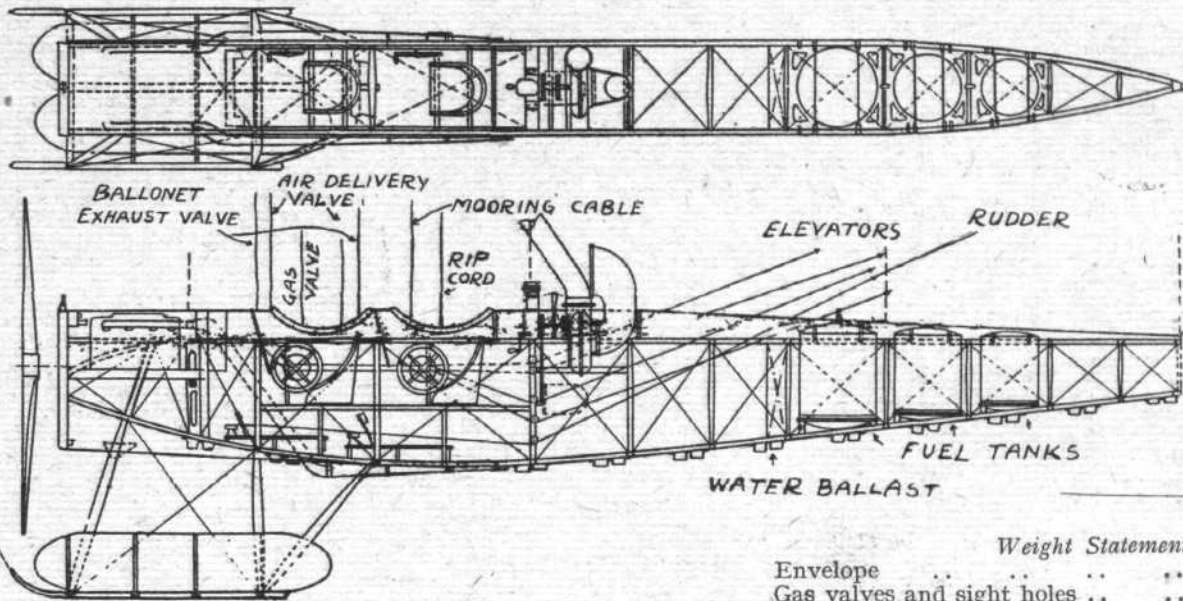
"Attacks were also made in co-operation with the military on ammunition dumps, on Ghent and Bruges. All machines returned safely."



# THE U.S. COAST PATROL DIRIGIBLE.

ABOUT six weeks ago the United States Navy Department asked for tenders for the construction of several small non-rigid dirigibles, to be used for coast and harbour patrol purposes. According to latest reports to hand, 16 of these dirigibles are now being built (three by the Curtiss Co., two

per hour; endurance at cruising speed, 16 hours. Capacity of tanks, 100 gallons, 600 lbs. Total volume of both ballonets, 19,250 cu. ft. Reserve ballast tank in car, 300 lbs. of water. Trimming tanks attached to envelope: Forward, 40 lbs. of water; after, 50 lbs. of water.



Plan and side elevation of the car of the U.S. Navy dirigible.

by the Connecticut Co., nine by the Goodyear Co., and two by the Goodrich Co.), deliveries to commence 120 days after date of contract. The contract prices range from £8,220 per dirigible. We quote below the principal details of this dirigible given in the official specifications, which, together with the accompanying scale drawings and diagrams, will serve as a fairly complete description of this type of airship.

This specification contemplates a non-rigid self-propelled dirigible for use in connection with coast or harbour patrol. It is intended that it shall be operated from a base on shore, but that it shall be possible for it to rest upon the surface of the water in good weather. The airship shall consist of a non-rigid envelope made of rubberised fabric and containing hydrogen under sufficient pressure to maintain the rigidity of the envelope. There shall be attached to the envelope vertical and horizontal fins and vertical and horizontal rudders, mooring line, rip panels, manoeuvring and safety valves, ballonets with means for their inflation. Beneath the envelope and supported thereby is carried upon a suspension a car or body containing the power plant, fuel, ballast, personnel, radio, &c.

The envelope fully inflated has a displacement of about 77,000 cubic ft., corresponding to a gross buoyancy of 5,275 lbs. when inflated with hydrogen of good commercial purity and under normal conditions of barometer and temperature.

The length of the envelope is 160 ft. and the maximum diameter 31.5 ft.; maximum width over tail fins, 36.2 ft.; the centre of buoyancy is 69.2 ft. from the nose; the height over all is 50 ft.; horse-power of motor, 100; horse-power of blower engine, 2; maximum safe altitude, 7,500 ft. Designed maximum speed at an altitude of 600 ft., 45 miles per hour; endurance at full power, 10 hours; cruising speed, 35 miles

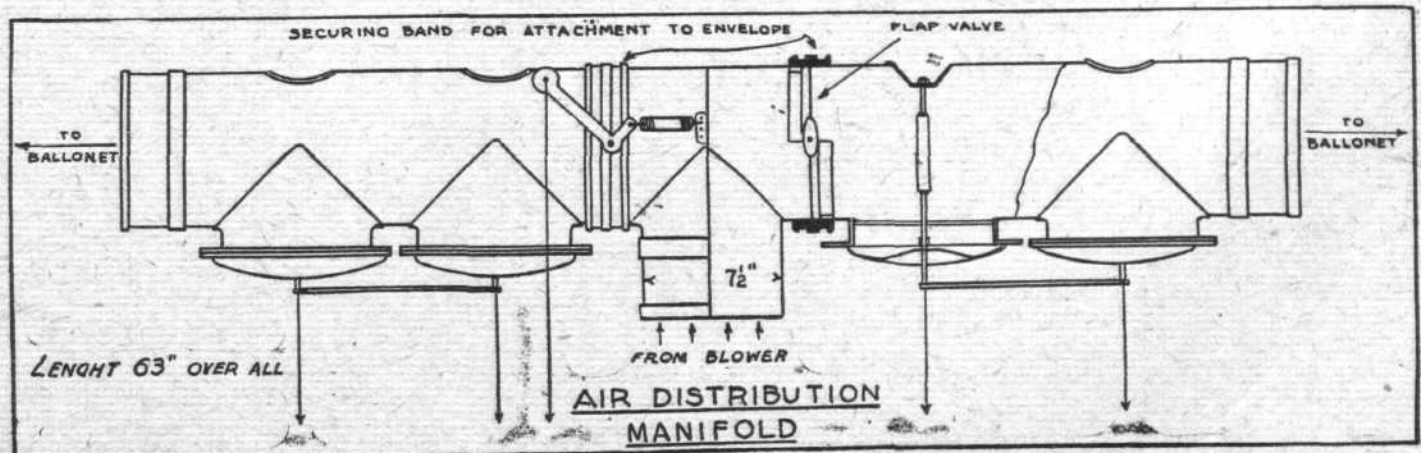
## Weight Statement.

Envelope .. .. .	1,177
Gas valves and sight holes .. .. .	36
Air ducts, valves, and manifold .. .. .	54
Suspension .. .. .	35
Ballonets .. .. .	350
Fins and rudders .. .. .	480
Running rigging .. .. .	43
Car :	
Structure, including tank weights .. .. .	321
Engine, complete .. .. .	568
Blower engine and blower .. .. .	100
Starting crank for main engine .. .. .	25
Lighting cells, wiring and lamps .. .. .	30
Landing gear and floats .. .. .	58
Miscellaneous fittings .. .. .	57
Total "penalty weight" .. .. .	3,334
Useful load :—	
Pilot and observer .. .. .	320
Instruments .. .. .	100
Radio .. .. .	250
Fuel and oil .. .. .	670
Water ballast (including trimming) .. .. .	390
Sandbag ballast .. .. .	211

1,941

Aluminium shall not be used for important strength members, nor shall any strength member depend for its strength upon brazing, welding, or soldering.

The equipment consists of tachometer, petrol air pressure gauge, circulating water and lubricating oil thermometers, oil-pressure gauge, longitudinal inclinometer, map boards, mooring rope, two gas pressure manometers, one ballonet air pressure manometer, altimeter, statoscope, compass, air



The air distribution manifold on the U.S. Navy dirigible.

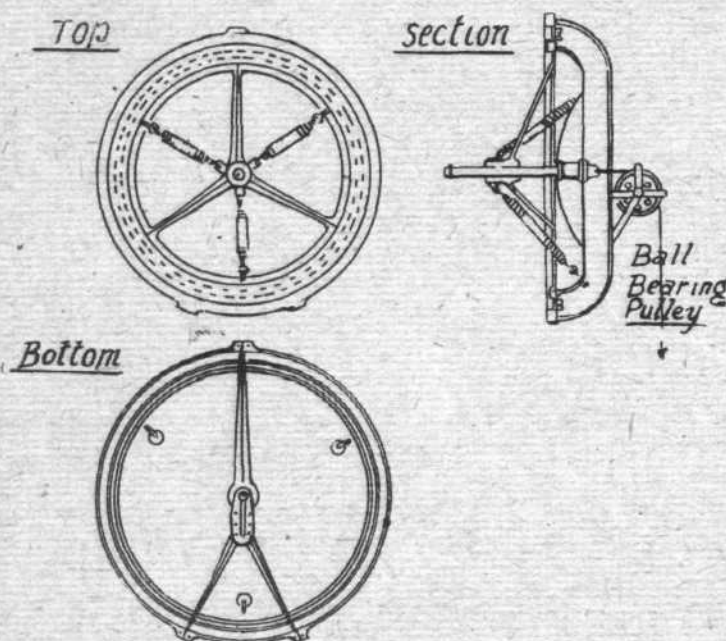


speed meter, fire extinguisher (chemical sprinkler type), searchlight.

The contractor must show that the fabric factor of safety under normal running conditions for any part of the dirigible exceeds 8. The strength to be taken as a basis, to be found by the methods given below.

All fabric used in the envelope or ballonets to contain two or more plies of cloth, one of which is to be laid on a bias of 45°. Sufficient rubber of proper quality shall be placed in the fabric to meet the requirements as to diffusion and weather-resisting properties, which are given below. The protective coating on the outside of the envelope shall be at least 0.4 oz. per square yard, and on the inside 0.2 oz. per square yard. No fabric in the balloon is to weigh over 12 oz. per square yard, and no fabric is to test less than 40 lbs. per inch in the direction of any of the threads, either bias or straight, test to be made as described below: Fabric in the top of the balloon shall show an average strength over 60 lbs. per inch for the four different directions of threads; or a strength over 100 lbs. per inch in either warp or filler if the two piles are doubled straight together for a sample test.

Each contractor for one or more dirigibles shall construct a model of linear dimensions one-thirtieth the size of the



Details of the lower safety and gas control valve on the U.S. Navy dirigible.

balloon, made of identical fabric, provided with suitable suspension disposed in similar fashion to that on the full-size balloon. This model to be inflated (upside down) with water to correspond with the full-size balloon when inflated to five times its normal running pressure. This will mean on the model a head of water at the top equal to 12½ ft. Leave pressure on for 10 minutes.

Each envelope when completed shall be blown partially full of air and all fabric inspected from the inside against a light to detect small leaks. After inflation with hydrogen at normal operating pressure, the envelope must show a leakage of gas less than 1 per cent. per day, with all valves and accessories in place. Envelope, with ballonets in place, after inflation with hydrogen shall be inflated to a pressure of 3 ins. of water at lowest point and held there for one minute. This is three times the normal pressure for flight, but no defects shall be developed by this proof test.

The nose shall be reinforced by a doubling patch of fabric similar to that in the envelope and wood battens about ¾ in. by 3 ins. in section equally spaced, converging at the nose, every alternate batten to extend beyond the doubling 3 ft. An eye shall be provided in the nose for a mooring line. This eye will consist of a 1½ in. metal thimble secured in an eye splice of a four-strand manila rope. The rope will be unlaidd and the eight strands let in beneath the doubling patch, equally disposed radially, the ends of the strands frayed and the whole set in cement. The breaking strength of the mooring attachment shall be about 5,000 lbs.

Rip panels, four in number, shall be located as shown with a rip cord, dyed red, run from each through light agate guides to the pilot. By pulling the rip cord weak stops securing the end of the panel are to break and tear open the panels for rapid deflation in an emergency.

Grab ropes, eight in number, shall be secured to patches on envelopes. These to be 1½-in. circumference manila rope secured to crows'-feet of ¾-in. flax signal halyard stuff (braided of 3-ply thread in eight strands of flax twine; breaking strength, 800 lbs.).

Ballonets are located as shown. Their combined volume is 25 per cent. of the total volume of the envelope. The relative sizes of ballonets are to be adjusted so that their displacements give equal moments about the centre of buoyancy of the envelope when completely inflated. The ballonets are to be fitted with a suspension band of fabric running around the plane of symmetry to which a light flax suspension is to be attached. Sight holes of transparent material are to be placed in the envelope for inspection of this suspension.

The lower part of the ballonet to be secured to a patch of doubled envelope fabric sewed and cemented to the envelope. This patch when removed carries with it the ballonet and wind-pipe connection. A sight hole shall be located in the ballonet patch for inspection of inside of ballonet. The safety valve will be located on top of the envelope. Construction of the valve is shown on detail sheet. This valve is to automatically open outwards when pressure in envelope at lowest point exceeds 1 in. of water. The manœuvre valve will be located under the envelope, and will operate as a safety valve also, but may be opened by means of a line to pilot's seat. The belly band or suspension band is to be a heavy fold of canvas, running around the lower part of the envelope, bearing at intervals hardwood toggles for the crows'-feet of the car suspension. This band shall be securely sewed and cemented to the envelope in a manner which on test is shown to develop the full strength of the latter fabric.

Stability of route is assisted by two horizontal fins and three vertical fins, as shown. These fins are to be 170 square ft. in area each, except the vertical fin shown on top of the envelope, which will be 80 square ft. area, and are to be made up of a light structure of steel tubing and wood with internal wire bracing and covered with airplane linen treated with five coats of dope and varnished to give a smooth, taut surface. The fins to be braced by wires with turnbuckles, and crows'-feet to doublings on the envelope. Weight of fins to be kept down to one-half lb. per square ft. Doubling patches shall be fitted on envelope to secure butt edges of fins by lacing.

Two horizontal rudders, each 70 square ft. area, and two vertical rudders, each 35 square ft. area, are to be provided. Both the horizontal and vertical rudders are to be balanced and to work in ball bearings. Rudders to be securely trussed and operated by non-conducting leads (flexible cable of flax line) passing through agate guide rings, or ball-bearing bronze sheaves as indicated on the plans. Rudder operating leads to give the least number of turns to reduce friction to a minimum. Fins and rudders to be readily detachable.

All steering controls shall be in duplicate and interconnected.

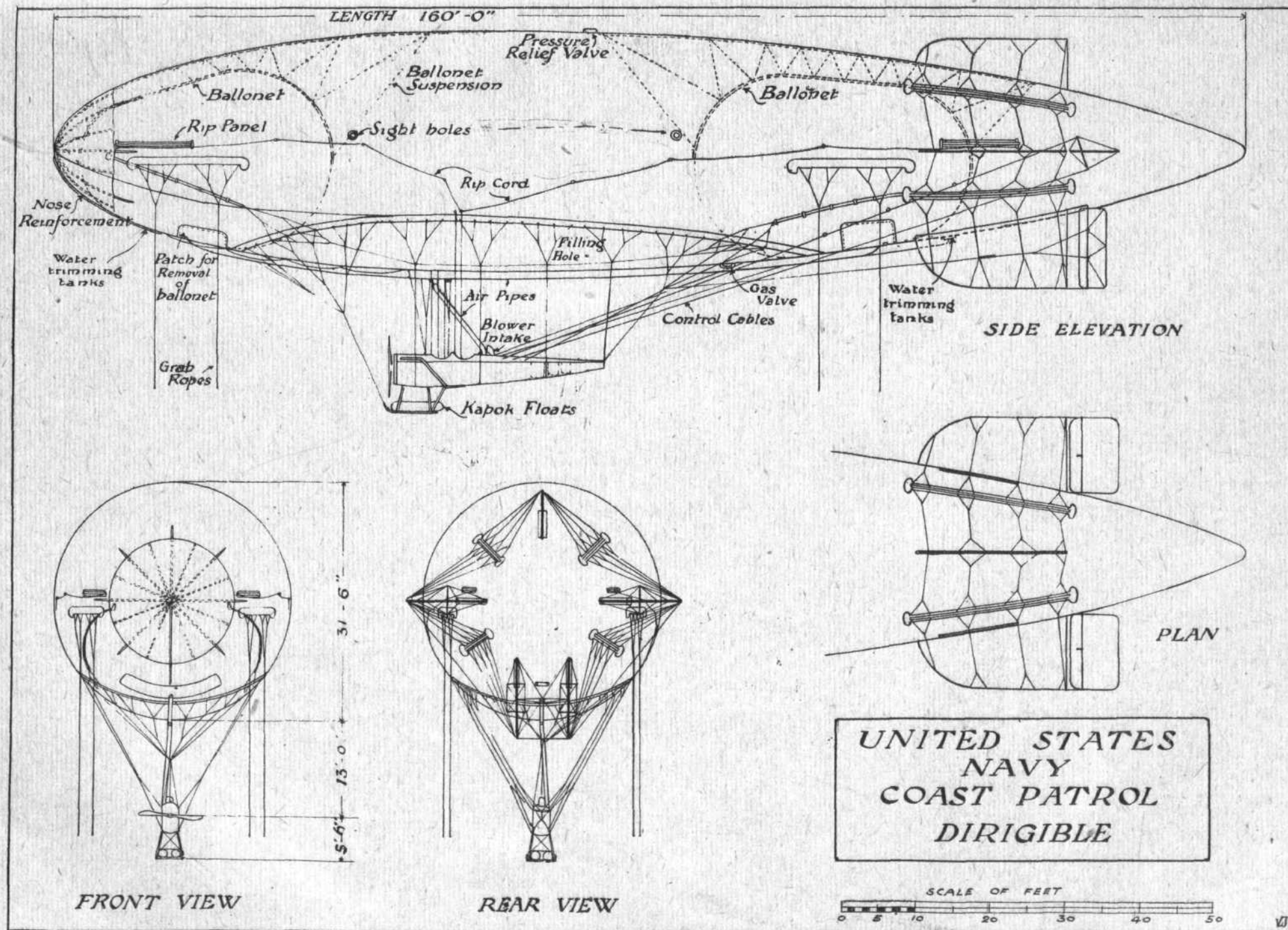
Tanks shall be provided sufficient for a ten-hour supply of fuel and oil at full power for the engine. The main fuel tanks shall be interconnected and so arranged that fuel may be taken from any tank or combination of tanks. Valves shall be operated from the rear seat, and shall be quick-acting. Fuel tanks shall be of non-corrosive material. If copper tanks are used, they shall be tinned on the inside. Tanks shall, before installation, be tested to an internal pressure of 5 lbs. per square in. and must show no permanent deformation.

The water-ballast tank shall be located in the body and be of 300 lbs. capacity, and provided with means for rapid discharge from the pilot's seat. The tank is to be made of waterproof fabric and shall be tight when full.

In addition to trimming the dirigible by manipulation of horizontal rudders or shifting air between ballonets, small water containers are to be placed near the bow and stern of the envelope, fitted with spring loaded valves, and means whereby such valves may be pulled open by the pilot. The forward tank shall contain 40 lbs. of water and the after tank 50 lbs. of water, and these tanks shall be located at the points shown in the general arrangement plan. The forward tank should be a fabric tube laced along a meridian with a valve in its lower after end. The after tank shall be as flat as possible and secured in a fabric pocket under the envelope and between the lower vertical fins.

A 2 h.p., 900 r.p.m. engine of motor-cycle type is to be arranged to drive through a 2 to 1 gearing a multivane blower of a capacity of 600 cubic ft. per minute against a head of 2 ins. of water. A crank is to be provided for starting the motor, which is to be accessible from the rear seat. Precautions similar to those stipulated for the main engine shall





THE UNITED STATES NAVY DIRIGIBLE.—Plan, side and end elevations to scale.



be provided for the blower engine to prevent flame from back-fire or exhaust.

The radio outfit will be supplied by the Government.

The car or body is of standard airplane type, consisting of a rigid rectangular girder of spruce trussed with wire. The engine and radiator are to be mounted forward, with a sheet steel fire bulkhead behind them; next the pilot with all controls and instruments; next the observer with duplicate controls and radio key; next the blower and radio outfit; next a fabric tank for water ballast; and last the petrol tanks. Reserve oil and gravity petrol tanks may be mounted near the engine. The car is to be enclosed with airplane linen except over the engine, where the covering shall be of sheet aluminium. The engine compartment shall be well ventilated and the bottom perforated to prevent accumulation of gasoline in case of leakage.

The car is to be electrically insulated from the envelope, and no valve or other operating leads shall be of continuous wire. All metal parts in car are to be electrically connected. Metal parts of valves and their seats, wherever located, shall be electrically connected.

The negative buoyancy of the ship on landing will be carried by skids of ash, to which are securely strapped, as shown, waterproof fabric cylinders stuffed with kapok fibre. The cockpits shall be of convenient size, seats and rims well upholstered, and arranged to insure the comfort and convenience of the pilot and observer.

The pilot, who is in the forward seat, shall have all neces-

sary and specified instruments and means for control of the ship. In particular his instrument board shall include two independent and different means for measuring the pressure of hydrogen in the envelope. The car shall have a jackstay along top and stirrups under bottom, as shown, to enable a man to reach engine or gasoline tanks in the air. The maximum propeller diameter permissible is 8 ft. 6 ins.

The car is to be suspended from the envelope by means of galvanised-wire cables with breaking strength of 2,700 lbs. arranged as shown. The cables are to be fitted with means for adjusting their lengths to equalise the load. The cables are connected to the suspension band by crows'-feet of braided flax,  $\frac{3}{4}$ -in. signal halyard stuff. To carry the car when the dirigible is inclined the upper ends of suspension cables are connected by a fore-and-aft stay as shown.

The suspension cables shall be connected to the car by hooks or bolts arranged to permit ready detachment.

## Power Plant.

Includes engine, propeller, radiator, starting device, petrol and oil tanks, piping, controls, petrol and oil gauges, pressure gauges, thermometer, power-transmission system, tachometer.

The engine shall be a standard Curtiss OXX-3, 100 h.p. aviation engine, or a Hall-Scott A-7-A, 100 h.p. aviation engine. The engine shall be provided with an effective starting device, so fitted and installed that engine may be easily started from the front seat. If hand starting is used, a booster coil will be provided.

## THE ROLL OF HONOUR.

### REPORTED by the Admiralty:—

#### Killed.

Flight-Lieut. J. E. Morgan, R.N.  
Sub-Lieut. A. Sandell, R.N.V.R.

#### Accidentally Killed.

Lieut. W. W. Primrose, R.N. (R.N.D., attd. R.F.C.).

#### Missing.

Flight Sub-Lieut. J. M. Ingham, R.N.  
Sub-Lieut. J. E. Maxwell, R.N.V.R.  
Sub-Lieut. H. W. Owen, R.N.V.R. (R.N.D., attd. R.F.C.).

#### Missing, believed Killed.

Flight Sub-Lieut. R. K. Slater, R.N.

#### Injured.

Flight Sub-Lieut. D. W. Gray, R.N.  
Flight Sub-Lieut. M. R. Kingsford, R.N.

#### Prisoners of War.

Flight Sub-Lieut. B. A. Trenchmann.  
F 8940 1st Grade Air-Mech. W. W. Higby, R.N.A.S.  
F 1866 Leading Mech. D. Kennedy, R.N.A.S.  
F 9197 Leading Mech. F. A. Wright, R.N.A.S.

### Reported by the War Office:—

#### Killed.

Lieut. C. McC. H. M. Caffyn, E. Surrey, attd. R.F.C.  
2nd Lieut. C. C. Gibbs, R.F.C.  
Lieut. A. S. Mackenzie, R.F.C.  
2nd Lieut. A. N. MacQueen, Gordon Hdrs. and R.F.C.  
Lieut. S. Stretton, R.F.C.

#### Died of Wounds.

Lieut. H. F. Duncan, Highland, L.I. and R.F.C.  
18046 1st Air-Mech. J. S. Hazell, R.F.C.  
8203 1st Air-Mech. G. C. Longley, R.F.C.

#### Died.

52755 2nd Air-Mech. W. Ironside, R.F.C.

#### Previously Unofficially now Officially reported Killed.

Lieut. C. M. Buck, I.A. Res. of Off., attd. R.F.C.

### Previously reported Missing, now reported Killed.

2nd Lieut. A. Appleton, R.F.A. and R.F.C.  
Lieut. H. Butler, York, attd. R.F.C.  
Capt. E. J. Henderson, R.F.C.  
2nd Lieut. L. A. Norris, R.E., attd. R.F.C.

#### Accidentally Killed.

2nd Lieut. R. P. Hamphill, Leinster, attd. R.F.C.

### Previously reported Died of Wounds, now reported Died.

41060 2nd Air-Mech. J. W. Chiverton, R.F.C.

#### Wounded.

2nd Lieut. G. C. Dell-Clarke, R.F.C.  
Capt. J. A. D. Dempsey, R.F.C.  
Lieut. O. R. Knight, Queen's (R.W. Surrey) and R.F.C.  
2nd Lieut. R. H. Lloyd, R.F.C.  
2nd Lieut. H. W. L. Poole, Duke of Cornwall's L.I., attd. R.F.C.  
2nd Lieut. R. T. Robbins, Lincolns and R.F.C.  
2nd Lieut. W. D. B. Taylor, R.F.C.  
Capt. A. M. Wynne, R.F.C.  
8468 1st Air-Mech. G. M. Campbell, R.F.C.  
61912 2nd Air-Mech. T. G. Davin, R.F.C.

#### Missing.

2nd Lieut. W. G. J. Clifton, Ox. and Bucks. L.I., attd. R.F.C.  
Lieut. W. P. Garnett, R. Berkshire, attd. R.F.C.  
2nd Lieut. N. L. Knight, R.F.C.  
Lieut. P. J. G. Powell, A.S.C., attd. R.F.C.  
2nd Lieut. A. G. Severs, R.F.C.  
Lieut. D. M. F. Sinclair, R.F.C.  
Lieut. H. P. Swarder, Queen's (R.W. Surrey), attd. R.F.C.  
Capt. H. Tomlinson, M.C., R.F.C.  
Lieut. C. S. Vane-Tempest, Durham L.I. and R.F.C.  
2nd Lieut. H. Welch, R.F.A. and R.F.C.  
2nd Lieut. V. F. Williams, R.F.C.

### Previously reported Missing, now reported Prisoners of War in German hands.

Lieut. C. B. Bird, R.F.A., attd. R.F.C.  
Lieut. T. G. Holley, Can. Inf., attd. R.F.C.  
Lieut. B. P. G. Hunt, Yeo. and R.F.C.

### Previously reported believed Taken Prisoner at Kut-el-Amara, now reported Prisoner.

445 Flight-Sergt. H. Campbell, R.F.C.

### Another Hun Attack on Salonica Hospitals.

It is learned from Salonica that a squadron of German aeroplanes on Sunday, April 1st, bombarded the hospitals at Exissou, despite the fact that the red crosses were visible from a long distance. Dead and wounded are reported among the patients and hospital staff, as well as among the wounded Bulgarian prisoners. This is the fifth attack which the Germans have made on these hospitals within a month.

### A Raid on Zeppelin Sheds.

The Danish frontier paper the Ribe News Reporter learns that British aeroplanes on March 21st or 22nd attacked the Zeppelin sheds near Töndern, on the west coast of Schleswig. The British aeroplanes dropped several bombs, but nothing has been stated as to the extent of the damage done. On the days following German aeroplanes were seen patrolling the coast.



# The Royal Aero Club of the United Kingdom

OFFICIAL NOTICES TO MEMBERS

## Flying Services Fund.

Boxes for collecting subscriptions for the Flying Services Fund are now available, and anyone wishing to have a box can obtain the same on application to the Secretary.

## New Club House.

Members are reminded that bedrooms and meals are available in the New Club House. The price of the House Luncheon and Dinner is 2s. 6d. and 3s. 6d. respectively.

## THE FLYING SERVICES FUND administered by THE ROYAL AERO CLUB.

THE Flying Services Fund has been instituted by the Royal Aero Club for the benefit of officers and men of the Royal Naval Air Service and the Royal Flying Corps who are incapacitated on active service, and for the widows and dependants of those who are killed.

The fund is intended for the benefit of all ranks, but especially for petty officers, non-commissioned officers and men.

Forms of application for assistance can be obtained from the Royal Aero Club, 3, Clifford Street, New Bond Street, London, W. 1.

## Subscriptions.

	£	s.	d.
Total subscriptions received to March 27th, 1917	11,221	7	6
Staff and Workers of Gwynnes, Ltd. (Thirty-sixth contribution)		9	12 3
Employés of Ruston, Proctor, and Co. Aircraft Works (Seventeenth contribution)		1	10 0
Total, April 10th, 1917	11,232	9	9

B. STEVENSON, Assistant Secretary.

3, Clifford Street, New Bond Street, W.

## Fatal Accidents.

WHILE flying near Walsall on the morning of April 7th an officer of the R.F.C. had to descend from a considerable height, and after clearing some houses alighted in the garden in front of one of them. The aeroplane seems to have struck a Mrs. North, who was walking in the garden with her granddaughter, Edna Vass, a baby, in her arms, and both were killed. The pilot was taken to a hospital with a cut on the face and suffering from shock, but it is understood that his injuries are not serious. The machine was damaged.

A verdict of "Accidental death" was returned at an inquest which was held on April 5th on Harry Collier Warren, a cadet in the R.F.C., who was flying as a pupil in a machine with 2nd Lieut. Claud Lowery as pilot. It was stated that the machine began to spin, and in spite of the efforts of the pilot the controls would not work properly. It was suggested that the rudder was jammed by air pressure. This was Warren's second trip.

A similar verdict was returned at the inquest on April 7th on 2nd Lieut. W. Hubert Peacock, R.F.C. He was a fully-qualified pilot, but while flying 100 ft. up he made a steep turn and shut off the engine, with the result that the machine turned over and nose-dived. He was killed instantaneously. It was stated to be an error of judgment to shut off the engine while turning at so low an altitude, though it could be done at a greater height.

While Lieut. A. E. Venables, R.F.C., was flying near a northern town on April 4th his machine caught fire. He was able to bring the machine to the ground, but he himself was burned to death.

## High-Tension Magnetos for Aircraft.

THE lecturer at the meeting of the Aeronautical Society on April 4th was Mr. A. P. Young, and his subject was "High Tension Magnetos, with Special Reference to the Ignition of Aeroplane Engines." In the first part of the lecture the history of the magneto and the general principles of its working were touched upon, then the lecturer gave a description of the M. L., Thomson-Bennett and B.T.H. aeroplane magnetos, the last-mentioned being dealt with in detail. Some advice on the care and installation of magnetos followed, and the lecture was concluded with the consideration of some of the special problems connected with the design and manufacture of aeroplane magnetos.

## King of Italy Flies.

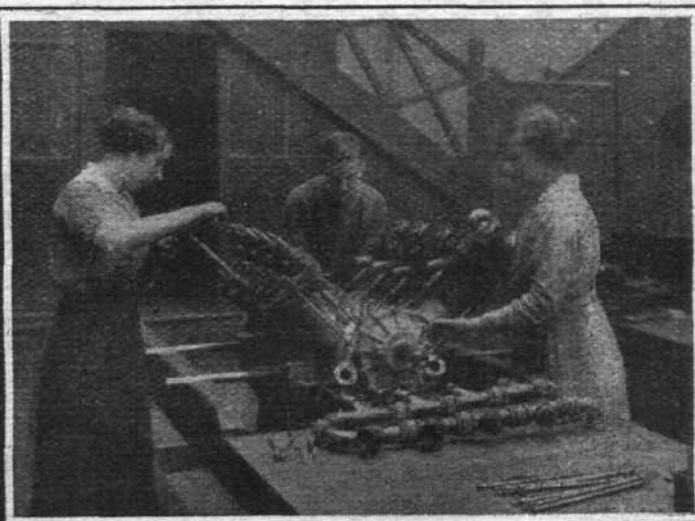
THE example of the King of the Belgians in taking advantage of the facilities offered by the aeroplane, has been followed by the King of Italy, who, it is announced from Tarente, arrived there from the front by aeroplane, a few days ago. This is said to have been His Majesty's first flight.

## Prince Friedrich Karl Dead.

ACCORDING to a telegram from Berlin on Tuesday, Prince Friedrich Karl, the German pilot who was shot down over the British lines, has died from his wounds.

## Kaiser Decorates Air Service Officers.

A MESSAGE received in Amsterdam on Tuesday stated that the Kaiser had conferred the Order Pour le Merite on General Hoepfner, in command of the German air services, and General Thomson, the chief of the general staff of the air services.



**THE DILUTION OF LABOUR.**—On the right, two women and a fitter stripping R.A.F. engine for inspection after three hours' endurance test. On the left, women building main planes.

(Published by special permission of the Ministry of Munitions.)

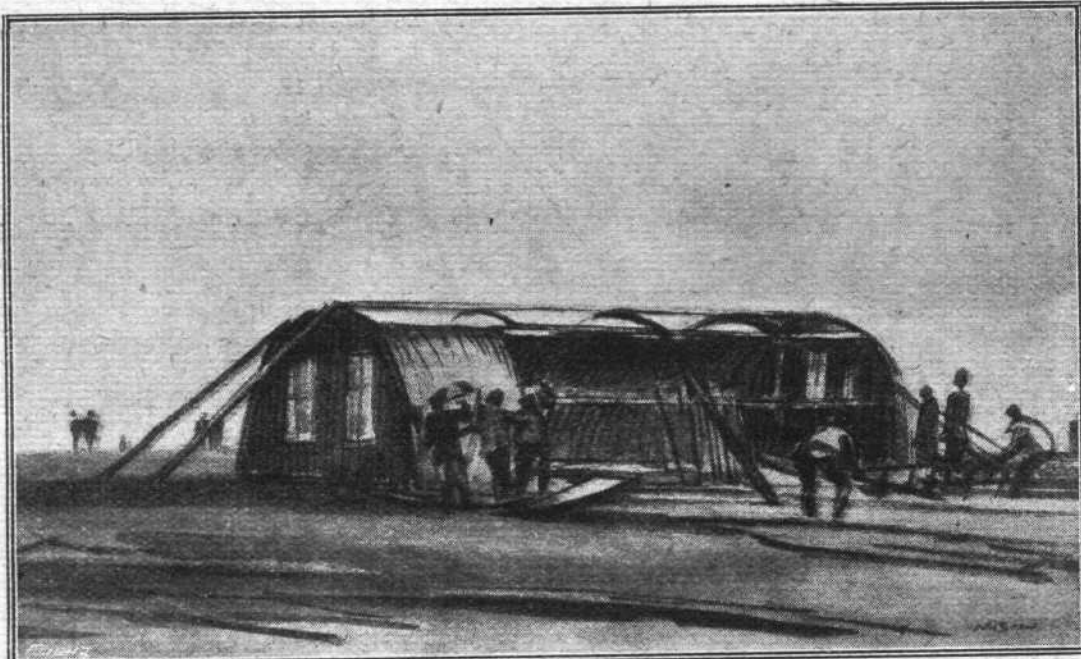


# AIRISMS FROM THE FOUR WINDS.

"THE Western Front" is where the future fate of the civilised world will be decided. In the meantime a very powerful series of drawings has been got together from the

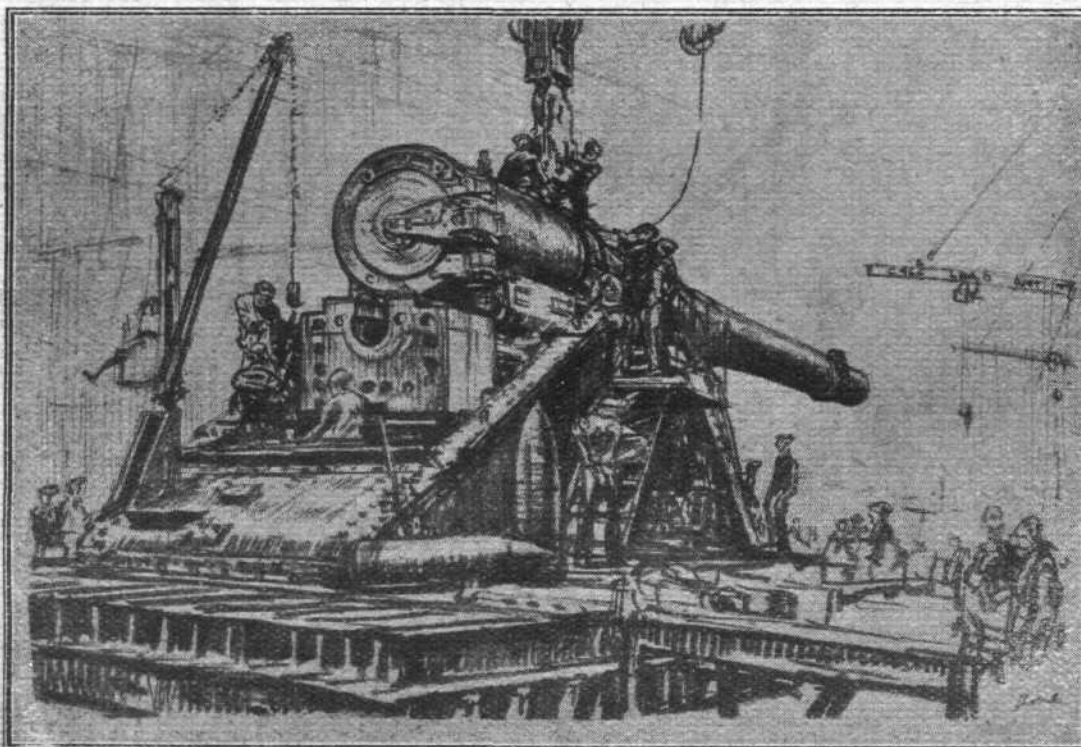
of the publication, the 20 plates in each portfolio covering the widest possible field, from the mounting of a great gun and other operations in the shops, to scenes in the fighting line,

On the Somme.—R.F.C. Men Building their Winter Hut. To most English soldiers it is one of the compensations of active service that they so often have to do work which is not their own trade nor soldiering. They find a flavour of the sport of peace-time camping-out in the work of making or finding their own shelter from the weather. Sometimes it is done, as here, with excellent materials, sometimes with hardly any at all, and the man who has built himself a rain-proof hut, for one, out of a few old biscuit tins, &c., enjoys a special thrill of triumphant ingenuity.



pencil of Mr. Muirhead Bone, and published in delightful form for the Government from the offices of *Country Life*, Ltd. Already four monthly parts have been issued, and

"The Blighty Boat," transports on the road, a hospital ship at a base, &c., &c. It is a work which will live beyond the war.



Mounting a Great Gun.\* —One of the largest guns viewed from the breech. However many large guns may have been turned out by the same men before, a glow of pride is always felt in a gun shop when one more masterpiece like this is ready at last to go out to its work in the field.

\*(Not for an aeroplane.—Ed.)  
Drawings by Muirhead Bone in "From the Western Front."

from Part IV we reproduce some specimens of Mr. Bone's illustrations, reduced in size, of more intimate concern to the readers of "FLIGHT." These, however, only cover one phase

OBSCURE house lights 9.30 p.m. under Summer Time regulations for the rest of April; 10 p.m. during May, 10.30 p.m. in June, and back to 10 p.m. for July, 9.30 in August



and 8.30 from September 1st to 16th, after which if the war is still going on, comes a big jump backwards.

CONSIDERABLE new interest is growing in the House concerning the Air Services. The seriousness of the situation is being grasped by a good many of the rank and file, all of which can have but a beneficial effect upon ensuring complete efficiency. So as to get figures in regard to casualties in the R.N.A.S. sorted out a little bit, when Parliament re-assembles, Mr. Joynson-Hicks, M.P., is asking the First Lord to state the number killed, wounded and missing in each of the last six months in the R.N.A.S. The crux of the thing is, however, the make of machine and engine.

ACCORDING to rumour, so as to afford the general German public an opportunity of knowing the why and the wherefore of the joining up with the Allies of the United States, in active hostilities, a German translation of President Wilson's speech declaring war on Prussian Militarism, is to be distributed wholesale in adjacent enemy towns by a number of aeroplanes. Peaceful penetration, with a vengeance. It sounds very Wilsonified, but emanates from Mr. Joseph Knapp, of New York, who, through Sir Arthur Conan Doyle, offers £200 towards the translation and printing of the pamphlet.

IN the country of the Hun they, like here, also have their Press Bureau, only more so—and it serves them right. Germany without doubt must have the command of the air, as their Press Bureau says they have. This is how the official communiqué to the Hun newspapers runs:—

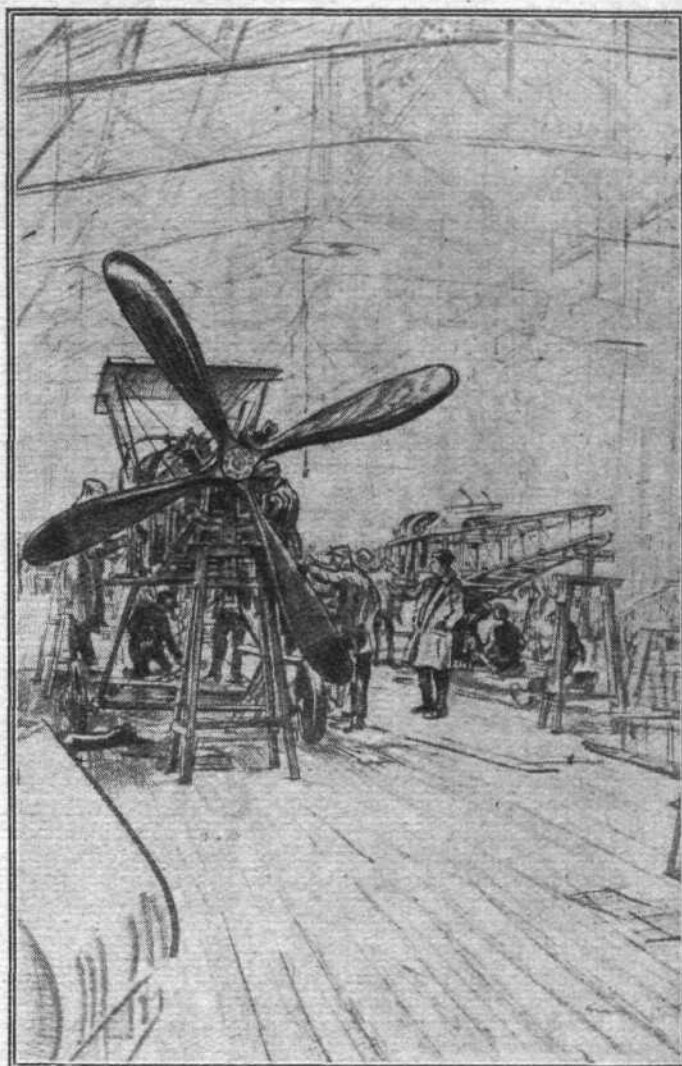
"German supremacy in the air, which is primarily that of pilots and observers, is manifested not only by the number of machines recently shot down, but also by the successful carrying out of our own aerial reconnaissance and the breaking up of that of the enemy. Thus our airmen discovered British infantry in strength in the valleys near Savy and Ruppy, and enabled us to subject them to destructive fire. Along the whole front between Arras and Soissons English and French reconnaissance sorties, made at times by strong squadrons of machines, were bloodily repulsed. Before being compelled to retreat they suffered heavy losses both from artillery fire and close fighting by our machines.

"Attempts made during the early evening hours and the night proved no more successful than the enemy's daylight efforts. Attacks on both sides of the Bapaume-Cambrai road and near Neuville failed in the same way as a thrice-attempted attack north of Epéhy. The same fate befell an attack on Ronsoy, as well as attacks near Le Verquier, which began after strong artillery preparation."

EVEN in war times, it's a bit disconcerting to an accused person to be kept in durance vile, awaiting his trial for a matter of 44 months. Such has been the portion, however, of M. Armand Deperdussin, in France, his trial, a few particulars of which are recorded elsewhere in this issue, having only just taken place, although he was incarcerated for his then alleged frauds on August 5th, 1913. This is, at any rate,

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 "Erecting Aeroplanes.  
 A great contrast to the scenes in the gun shop. Here everything is light and delicate, the bright varnished wood curved to delicate shapes like violins, the women flitting with their needlecraft around the wide, dazzling planes and the brilliant pigmy engines shining like jewels—all seem gay and exhilarating after the sombre company of the guns. There is even a lightsome airiness about the thought that these delicate creations fly away from their makers' hands when completed, and do not burden any railway with their transit.

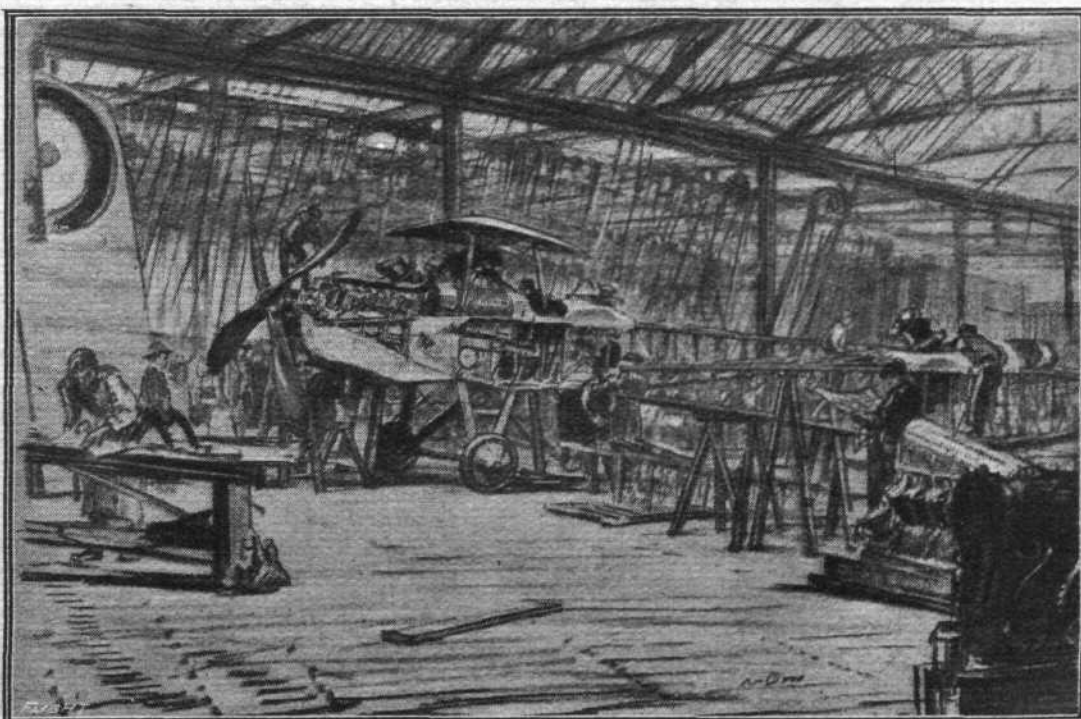
~~~~~  
 Drawing by Muirhead Bone in "From the Western Front."



Drawing by Muirhead Bone in "From the Western Front."  
 AN AEROPLANE ON THE STOCKS.—Another view of the same shop. Close to, the propeller seems a great thing, wonderfully subtle in its graceful curves.

one of the things they do not do better in France. It has at least the merit of ensuring a fairly dispassionate trial.

LADY DROGHEDA'S "Grosvenor Gallery" historical exhibition of matters aeronautical and the Zeppelin relics





recently on view in the Temple Gardens are now "on tour" in the Provinces, with the goodwill of the Army Council and the Air Board. We venture to prophesy a very successful issue to this enterprise, even more so than in London. Lady Drogheda, who is her own "advance agent," opens on Saturday of this week in the Town Hall, Birmingham, the next stop on April 23rd being Coventry, and from there the exhibition moves to the Walker Art Gallery, Liverpool. Edinburgh is also likely to have a date, at the Synod Hall. As in London, the proceeds are devoted to worthy objects, viz., to the Flying Services Hospitals and Lord French's War Charities.

Thus "The Londoner" in his diary in the *Evening Standard* last week:—

"A propos of the arming of our ships and American naval co-operation in the Atlantic, I hear from a reliable source that in those wide waters the only effective anti-submarine weapons are gun-fire and bombs. These latter continue to be successfully launched from seaplanes, my informant stating that an airman 1,000 ft. up can detect a submarine 100 ft. below the water, provided the weather is not too boisterous.

"In the matter of arming vessels a gun at the stern and two towards the bow are advocated, and in this connection I hear that a large portion of the expense will be in connection with the 'stiffening' of the vessels, which are generally single-deckers. It is proposed that the new standardised vessels shall have a speed superior to the submerged speed of a submarine. This will enable steamers to escape while the enemy is submerged, and to attack with their gun if he appears on the surface."

Here's another note, with for heading "The Modern Romeo," from the same source:—

"Not a hundred miles from London is a certain aerodrome, and five minutes' flight from that, on the top of a hill, stands a farmhouse. The farmer has a nice collection of eligible daughters, and some time back several of them rushed to the assistance of a flying man who had made a forced landing in a large field near-by. When he rose again he carried in his memory an impression of the youngest girl, and a few days later discovered another excuse to alight at the same spot. People living in the neighbourhood tell me that this proceeding has become a matter of regular occurrence, and that the airman usually finds an opportunity to encircle over the roof of the farm buildings, and having called the attention of the maid of his adventure, to spend a few minutes in her society. His courtship is attracting increasing public sympathy, as the crowd grows which collects every morning to witness his evolutions, and remains—an inquisitive company—to mark the progress of his less—or more—serious interests."

TWELLS BREX evidently has his eye upon controlling the new War Museum, when it arrives, else why should he so assiduously take the trouble to plot out suggestions for exhibits therein? Some of his gallery of relics and curio items should prove distinctly precious. Without doubt his suggestion No. 9 will receive many a sympathetic "Hear, hear," from victims of the much prayed for *Daily Mail* standard bread, which, plus a few other nourishing ingredients, has now arrived. No. 9 is to be "reputed 'Unexploded Zeppelin Bomb.' The ignorant treasured many such 'relics' during the great war. Modern science has proved them to be loaves of war bread as sold by opportunist bakers of the period."

This should assuredly have a near-by place to No. 1: "Convex mirrors, as fixed in the exits of restaurants and clubs in 1917 by order of the Food Control Department to maintain the moral of the public."

LAST week we recorded a human touch associated with the graves of two of our airmen who fell behind the German lines. This week further evidence is forthcoming from the correspondents at headquarters in France of the exceptional treatment accorded by the Huns to flying men, dead as well as alive. Describing the scenes on the German retreat, in the *Times*, the special correspondent writes:—

"In curious contrast to the general savagery of the retreating enemy and his impious violation of holy things are the graves of British flying men, which are found in various graveyards carefully tended. These are a manifestation of that better and more chivalrous spirit which has been maintained between the Flying Corps of the countries, and it may be also that the Germans know that these will be preserved, and hope they will stand as a permanent refutation of the general charge of barbarism. However that may be, at Douilly is the grave of two nameless brave British airmen

(*tapfere Englische Flieger im Luftkampf Gefallen*) bearing the date December 15th, 1915. The grave has a fine cross wreathed in the sash of the German tricolour, and is planted with snowdrops, now blossoming, and edged with a neat box edge. I am told, but have not seen the graves, that four British flying men are buried in Beaumetz cemetery, namely, Lieut. Clark, Sergt. Walker, Lieut. H. J. Newton, and Sergt. J. A. Ormsby. It will take, however, more than the graves of half a dozen brave flying men to offset the damning evidence of all these miles of desolation and outrage."

## TEN YEARS AGO.

Excerpts from the "Auto." ("FLIGHT's" precursor and sister journal) of April, 1907. "FLIGHT" was founded in 1908.

### M. SANTOS DUMONT'S PROCEEDINGS.

On the 27th ult., M. Dumont made charges across the ground at St. Cyr, and again he failed to get off the ground. Unfortunately, he demonstrated that preliminary trials on *terra firma* may prove quite as destructive to an aeroplane as free flight through the air. Once he careered over the ground in a circle without developing sufficient speed to lift. On his second attempt the unevenness of the ground caused the machine to jolt over on one side, smashing the right wing, whereupon it immediately fell over on to the other side and smashed the left wing also. In fact, the motor is the only part of the aeroplane left intact, and that does not belong to the new machine at all.

### THE DE LA VAULX AEROPLANE.

Count de la Vaulx, who, as we have already announced, has become a convert to the aeroplane, is having a machine built for him by M. Mallet. It is to have a lifting surface of 40 square metres, to be driven by a 50 h.p. Antoinette motor, weigh altogether with the aeronaut about 400 kilogs., and will, it is calculated, rise from the ground when a speed of 40 k.p.h. has been reached, a forecast which the recent flight of the Delagrang machine renders probable.

### M. SANTOS DUMONT'S ACCIDENT.

We do not know that there is any advantage in going at too great detail into the matter of M. Santos Dumont's last and, in many ways, most irritating accident. On April 1st and 2nd the atmospheric conditions were very unsatisfactory, so M. Santos Dumont very wisely refrained from attempting to fly at all. It was a pity that he did not adopt the same course on the Wednesday. But the wind was still high and squally, and even at noon the experiment was postponed till 3 o'clock in the hope of things improving. At 5 o'clock he again started the motor and decided to make the attempt, as the sky had cleared and the wind seemed to be dying down. In another instant the aeroplane, "No. 14 bis," the record machine fitted again with its old motor, was off like a shot, and rose gradually in the air for upwards of 20 feet from the ground. It appeared to be travelling admirably, and had made a flight of 50 metres at high speed, and the spectators began to hope that they would have the privilege of witnessing a real record performance, when a gust of wind upset the balance of the machine, and before M. Santos Dumont could right it, the machine turned on its side and came to the ground—while travelling at a speed of 50 kiloms. per hour.

### THE DELAGRANGE MAKES ANOTHER UNLUCKY FLIGHT.

The Delagrang aeroplane repeated its performance of Saturday week on the 7th instant, going out at Bagatelle at about half-past 11, rising in the air to some two or three yards from the ground, and making a steady flight of 60 yards before coming to ground again. Unfortunately, owing to the presence of the crowds in the neighbourhood, the evolutions of the aeroplane were interfered with. In endeavouring to avoid some of the spectators, M. Voisin, who was piloting the machine, caused it to twist and swerve, bringing it to the ground, and causing a considerable amount of damage to its framework, and twisting the propeller.

### THE AERO CLUB'S EXHIBITION AT THE AGRICULTURAL HALL.

The Aero Club's Exhibition, which fills two large galleries at Messrs. Cordingley's Show, makes quite a multiplicity of impressions on the visitor. The first and, perhaps, most prominent feeling it evokes, is one of profound hopefulness. Casual visitors who run away with the impression (which they may very easily get) that the Exhibition proves the problem of the conquest of the air to have been solved, are, as usual, getting hold of the wrong end of the stick altogether, but it certainly does justify a more optimistic attitude than any previous exhibition, for it shows that the inventive intellect of the country has awakened to the importance of the problem as it has never done before.



# THE SCREW PROPELLER IN AIR.

By M. A. S. RIACH.

(Concluded from page 330.)

## A COMPARISON OF THE NEW THEORY WITH PRACTICAL DESIGN RESULTS BASED ON THE OLD METHOD.

I now propose to discuss the differences which occur in practical design calculation between the results given by the new theory and those obtained by the old method employing correction factors.

It will be sufficient to outline a method based on the new theory whereby the correction factors may be calculated and the values of which may then be compared with those employed in drawing office design work.

Consider the calculation of the blade width constant on the new and old theories.

On the old theory the constant ( $C$ ) is given by:—

$$C = \frac{8\pi^3 N^3 p \cdot \int_{r_0}^r cy \cdot f(x) \cdot x^3 \cdot \sec A \cdot (\tan A + \tan \gamma) \cdot dx}{550 \cdot H}$$

and when this constant has been obtained in any given case it is usual in practice to multiply it by a correction factor ( $1/f$ ), so that the real value of the constant then becomes ( $c/f$ ).

Now, on the new theory the blade constant ( $c_1$ ) is given by  $C_1 =$

$$8\pi^3 N^3 p \cdot \int_{r_0}^r cy_1 \cdot f(x) \cdot x^3 \cdot \sec A_1 \cdot (\tan A_1 + \tan \gamma_1) \cdot dx$$

and therefore if this new value ( $C_1$ ) is assumed to be the correct value, no correction is required and hence we must have:—

$$C_1 = \frac{c}{f}$$

and  $\therefore$

$$\frac{1}{f} = \frac{C_1}{C} = \frac{\int_{r_0}^r x^3 \cdot f(x) \cdot cy \cdot \sec A \cdot (\tan A + \tan \gamma) \cdot dx}{\int_{r_0}^r x^3 \cdot f(x) \cdot cy_1 \cdot \sec A_1 \cdot (\tan A_1 + \tan \gamma_1) \cdot dx}$$

and we may then obtain the value of the correction factor ( $1/f$ ) in any given case considered.

This value appears to vary from about ( $1/75$ ) to ( $1/85$ ), and hence we may in this way form an estimate of the correctness or otherwise of the new process of design outlined in the paper.

I have found that, unless some allowance is made for the end effects on blades, the value of ( $1/f$ ) obtained from this formula is usually below that given and of amount ( $1/9$ ) to ( $1/95$ ) approximately.\*

A rough estimate of the value of ( $1/f$ ) may be obtained by considering an element of blade at about ( $\frac{1}{2}$ ) the extreme radius, and then we get:—

$$\frac{1}{f} = \frac{cy}{cy_1} \cdot \frac{\sec A}{\sec A_1} \cdot \frac{\tan A + \tan \gamma}{\tan A_1 + \tan \gamma_1}$$

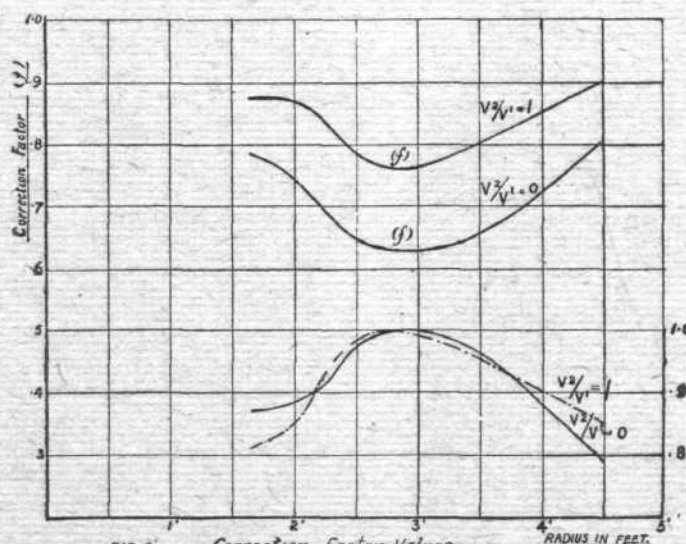


FIG. 8 Correction Factor Values for several Radii

\* Unless the blades are very wide, when the ratio becomes larger. It is really unsafe to generalise on this point, as it is quite conceivable that the correction factors commonly employed in the old theory are liable to variation—in which case the end effects on blades might be sufficiently small to be neglected entirely. Without wind-channel results it is extremely difficult to determine whether such fine points as these require modification or not. I think, however, that it may be taken for granted that narrow bladed airscrews require smaller correction factors than those with wide blades quite apart from any possible end effects which may alter the character of the purely two-dimensional form of flow considered in the theory developed in the Paper.

for any radius considered, or preferably for a radius equal to about ( $\frac{1}{8}$ ) the diameter of the propeller.

Considered from the point of view of actual propeller design work in the drawing office, the method here outlined presents greater arithmetical difficulties than the old process of design owing to the fact that, in order to determine the value of the blade constant ( $C_1$ ), it is necessary to employ a somewhat tedious graphical process of solution.

Fig. 8 shows a graph of ( $f$ ), plotted from the formula for an element already given, against radius for values of ( $V_2/V_1$ ) of zero and unity. It will be noticed that as the radius increases the value of ( $f$ ) falls and then rises again at the blade tip—a rise which I contend is probably due to neglecting the end effects analogous to the tip losses on aerofoils. The exact quantitative amount of such losses it does not seem to be possible to estimate at present, although further work in this direction may possibly enable some fixed percentage to be determined capable of being applied to most cases met with in practice.

The particular airscrew of which this graph forms an analysis had a revolution speed in excess of the designed value, as might be gauged from the fact that the “two-dimensional” values of ( $f$ ) on the curve are less than the values usually allowed for the correction factors in actual propeller design.

The two other curves shown in Fig. 8 have been obtained by assuming a constant correction factor across the blade from boss to tip in conjunction with the two ( $f$ ) curves already given in the same figure. These resulting curves form what may be considered a somewhat rough average of the end losses, boss and tip, to be taken into account in actual propeller design on the assumption that the correction factor necessary on the old theory remains a constant for all values of the radius.

Finally, an approximate formula has been deduced for the calculated correction factor ( $f$ ) at any radius, in terms of the known quantities used on the old theory.

The formula obtained is:—

$$f = \frac{Cx + \frac{K \cdot m \cdot (a - \beta)}{K + m} \cdot \tan \left[ A + \frac{m \cdot (a - \beta)}{K + m} \right]}{Cx + Cy \cdot \tan A}$$

where

$Cx$  = absolute drag coefficient of section at ( $a^\circ$ ).

$Cy$  = “ lift “

$a$  = angle of attack on old theory as already defined.

$\beta$  = “ no-lift of section.

$K$  = a constant depending upon blade width and the ( $V_2/V_1$ ) value.

$m$  = a constant depending upon the characteristics of the section employed.

$A$  = the helix angle at any radius as already defined.

( $K$ ) = ( $\cdot 1$ ), ( $m$ ) = ( $\cdot 05$ ) are ordinary values occurring in practice.

( $Cx$ ) may have a value of about ( $\cdot 03$ ) depending upon the section of the blade.

An example shows the application of the above formula in the determination of ( $f$ ) on the new theory.

Let  $Cx = \cdot 03$ ,  $Cy = \cdot 35$ ,  $a = 4^\circ$ ,  $\beta = -3^\circ$ ,  $K = \cdot 1$ ,  $m = \cdot 05$ ,  $A = 12^\circ$ .

$$\text{then } f = \frac{\cdot 03 + \cdot 233 \tan [12 + 2 \cdot 33]}{\cdot 03 + \cdot 35 \times \cdot 213} = (\cdot 857)$$

and therefore ( $f$ ) = ( $\cdot 857$ ), so that ( $1/f$ ) = ( $1/857$ ), giving the calculated value of the correction factor required on the new theory.

In conclusion, the main points brought forward by the new theory, as an indication of possible directions in which enhanced efficiency may be expected to be found, appear to be as follows:—

(1) The importance of high aspect ratio, that is, multiple blades.

(2) Good sections having high lift-drag values as aerofoils.

(3) Correct ( $V/n \cdot d$ ) values for maximum efficiency.

(4) Wide blades should only be employed in conjunction with the correct chord angles for best efficiency as given by the methods here outlined.

(5) There is still some uncertainty as to the correct amount of end tip loss to be allowed for, and further information regarding the ( $V_2/V_1$ ) values will probably be found to be necessary.

(6) Multiple bladed airscrews should, if the foregoing theory is correct, require more B.H.P. to turn them than their two-bladed equivalents under similar conditions, but they should develop a greater thrust at the same forward and rotational speed, and their efficiency should be higher.



(7) Multiple blades raises the question of the requisite strength and consequent area of the sections from boss to tip, which cannot be decreased indefinitely without fear of bursting taking place. Advantage may however be taken of the fact that a very slight forward rake is usually sufficient to convert the whole stress into a pure tension, and consequently a much

smaller section can then be employed. It should, however, be noted in passing that the centres of area of the blade sections along the blade should not in general lie on a straight line, but on a curve, the determination of which may be accomplished, as a rule, without much difficulty. All the sections will then be stressed in pure tension.

## THE DEPERDUSSIN CASE.

JUDGMENT in this case was delivered in the Seine Assize Court on March 30th. In the indictment against A. Deperdussin it was alleged that he made fraudulent use of his position to obtain huge sums of money which he converted to his own purpose. The indictment further set forth that M. Deperdussin was the creator of several new aeroplane models, the owner and manager of two great aeroplane factories, and of the well-known aerodrome in the Champagne country. In recognition of his services to the cause of French aviation the Government created him a Knight of the Legion of Honour. After his great success in the aeroplane world he began to take a hand in theatrical enterprises; he established a private sanatorium for wealthy persons; he financed a hot-air therapeutic institute, all of which enterprises were, it is alleged, built up with funds obtained by fraud.

Armand Deperdussin lived in Belgium until 1901, when he came to Paris to reside permanently. He was possessed of very small means, being a traveller for a silk firm in the Rue des Jeuneurs. He was a man of ambitious schemes, the principal of which was to form a gigantic "silk trust." With a view of carrying out this scheme, he got into touch with the Comptoir Industriel et Colonial, the managers of which were greatly struck with the possibilities of profits shown by Deperdussin. For a period of ten years—namely, from July, 1903, to July, 1913, he carried out, with the assistance of the bank, a series of gigantic financial transactions in silk, totalling some £8,000,000. In the course of these transactions it is alleged against Deperdussin that he committed a number of frauds and forged numerous orders, in the course of which he caused the bank to suffer a loss of over 28,000,000 francs, and misappropriated to himself 16,000,000 francs. His wife was arraigned in the dock with Deperdussin. She was a shop assistant at a silk mercer's when Deperdussin married her; a woman of great business ability, who, it is alleged, aided and abetted her husband in all his transactions. Deperdussin had made a prenuptial contract with his wife whereby there was a complete separation of property rights between the couple. This, it is alleged, enabled Deperdussin to pass over the proceeds of his frauds to his wife. The lady is now in possession of a substantial fortune, which she alleges she made by speculating on the Paris Bourse.

Deperdussin, who looked as though his long confinement had told on his health severely, unreservedly admitted his guilt. He pleaded guilty to all the charges of fraud brought against him, but argued in extenuation of the offences that the great services he had rendered to the country should be taken into consideration.

The Judge remarked: It transpires from the evidence that you spent a sum of about £120,000 on aviation.

The prisoner replied: I expended more than double that amount—more than £250,000!

The Judge: Yes! But this money, fraudulently obtained, was the cause of your being honoured.

The prisoner: It is true, but I seemed to live in a sort of mirage. I ended by believing that the thing was quite natural. If I spent so much money on aviation I was induced to do so by the great popularity I enjoyed. Everybody was throwing incense at me. I became a "mug." When a man wanted to borrow a pound from me I gave him a "fiver." That is the sort of man I had become. It is sad for me to confess it, but once caught in the groove I was obliged to go on doing this or lose my position. There was no escape for me.

Speaking of the Champagne aerodrome, Deperdussin alleged that he acquired the place to prevent Mr. de Mumm, the great German champagne grower, of Rheims, from converting it into a centre of German espionage. It was true he had bought jewels to the extent of £40,000, but most of these jewels were given away as presents to aviators who had won prizes. He declared that his wife was quite innocent, that she was his first and his greatest victim.

Mme. Deperdussin, for her defence, stated that she never dreamed her husband had robbed all the money he was supposed to earn. It was only two days before his arrest that he confessed the whole thing to her.

Many well-known French military aviators gave evidence, among them Vedrines and Gilbert.

Adjutant Vedrines said: I am bound to say that Deperdussin, by the keen interest he took in aviation, rendered an immense service to the French nation. It was he who had the first notion of rapid flying, which was strongly opposed and flouted at the time by all the official exponents of the new science.

Lieut. Gilbert said: Deperdussin, by his generosity, by the real knowledge he showed, by his clever initiative, paved the way for our present military superiority in the air, and I have only one regret to express; that is, that Deperdussin was not set at liberty at the outbreak of war, so that the country might have had the benefit of his wonderful knowledge.

The second day of the trial was chiefly taken up with an account of the heavy losses sustained by the Comptoir Financier.

Major Roche, Director of the State School of Aviation, having given evidence to the same effect, M. Georges Prade, the well-known expert aviation journalist, stated as follows:—

"Deperdussin came on the field at a time when, for lack of funds, the progress of aviation in France was at a complete standstill. All our best specialists had gone to Germany, engaged there at big salaries to build aeroplanes for German manufacturers. Then it was that Deperdussin, a man of undoubted genius in all that concerns the construction of aeroplanes and air machines, began to spend large sums with an unstinting hand. He raised up the declining industry; he caused the closed aeroplane factories in France to be reopened; he gave numerous orders; he engaged one of the best engineers to be found, M. Bechereau, and opened up an entirely new vista. Hitherto nobody, either in France or Germany or England, had studied the speed possibilities of the air machine. Thanks to the untiring, costly and energetic investigations of M. Deperdussin and his engineer the problem was solved. The war avions mounted to-day by all our most renowned 'Aces' are nothing else than a transformation made, for military purposes, by M. Bechereau, of the Deperdussin speed avion formerly mounted by Vedrines."

The general manager of the Spad Avion Company, who are now controlling the Deperdussin factory, gave evidence to the effect that since the war the French Government had given orders for Deperdussin aeroplanes to the value of 70,000,000 francs (£2,800,000). If Deperdussin had remained in the company his share of this would have amounted to 14,000,000 francs (£560,000).

On behalf of the Comptoir Financier evidence was given in detail as to the extraordinary frauds of which it had been the victim for a period of ten years. Deperdussin being now insolvent there was no chance of getting the money back, and the bank was, therefore, fain to claim the sum of one franc for nominal damages.

The Advocate-General, M. Frémont, for the Public Prosecutor, asked for a severe verdict and sentence against Deperdussin. He made no objection to the acquittal of Madame Deperdussin, the charge against her of complicity and receiving stolen property not having been proved. Deperdussin's services to the science of aviation had nothing to do with the criminal offences he had committed.

On the third and final day of the trial Maître Henri Robert addressed the jury in defence of Mme. Deperdussin.

The jury retired with nearly 2,000 printed questions to answer. After some delay they asked to see the Presiding Judge, his assessors and counsel for the defence, when the Foreman said: "The jury have unanimously decided to ask the Court to give the prisoner Deperdussin the benefit of the law of 'Sursis' (indefinite postponement of the carrying out of a sentence, in the case of first offenders) or First Offenders Act." After a consultation extending over three hours, the jury found Deperdussin guilty, with extenuating circumstances, and his wife not guilty. Mme. Deperdussin was acquitted and Deperdussin sentenced to five years' penal servitude, with the benefit of the First Offenders Act, so that he was immediately released.



# AVIATION IN PARLIAMENT.

## Naval Officers' Inventions.

MR. BILLING, in the House of Commons on April 2nd, asked the First Lord of the Admiralty the names of the officers of the Royal Naval Air Service who had designed the aeroplane or seaplane which had been successfully employed against the enemy?

Dr. Macnamara: Wing-Commander Porte, R.N.

## Experimental Work.

MR. BILLING asked the First Lord of the Admiralty, in view of the New Order of the Ministry of Munitions made under the Defence of the Realm Act prohibiting firms from proceeding with any experimental work unless they have the direct sanction of the Ministry of Munitions, if he will state what is the position in these circumstances of the firm which is now doing experimental work for the Royal Naval Air Service?

Dr. Macnamara: The supply of all aeroplanes and seaplanes and experimental work in connection therewith, are under the direct control of the Air Board and the Ministry of Munitions.

Mr. Billing: Are airships of the Royal Naval Air Service also under that control?

Dr. Macnamara: I will consider it if the hon. gentleman will put a question down.

## Attacks on Zeebrugge.

MR. BILLING asked the First Lord of the Admiralty whether his attention had been drawn to the results obtained by the Royal Naval Air Service on the enemy submarine bases at Zeebrugge?

Dr. Macnamara: Yes, Sir.

Mr. Billing: Are they satisfied that these reports show the maximum amount of damage and the maximum number of raids which have been carried out?

Dr. Macnamara: I am not going to answer that.

Mr. Billing: The information for which I am asking the right hon. gentleman what we have done in the past? Surely that may be given.

Mr. Speaker: Is there any use asking if they are satisfied? Nobody in this world is ever satisfied.

## R.N.A.S. Commands.

MR. BILLING asked who is in supreme command of the Royal Naval Air Service squadron stationed at Dunkirk?

Dr. Macnamara: I am not prepared to give particulars of the various commands.

Mr. Billing: May I ask whether the officer who is responsible for initiating raids is stationed at the Admiralty, or where the squadrons are operated?

Dr. Macnamara: That is the sort of information I am not disposed to give.

Mr. Billing: May I ask the right hon. gentleman to see that the officer stationed at Dunkirk has a freer hand?

## Officers' Casualty List.

MR. CHURCHILL (*by private notice*): I wish to ask the Under-Secretary of State for War whether his attention has been drawn to the fact that the casualty list appearing in this morning's papers contained the names of 63 officers killed or missing, and of this total for the whole of the Army no fewer than 31 are aviators of the Royal Flying Corps; and whether any explanation can be given of this remarkable disproportion?

The Under-Secretary of State for War (Mr. Macpherson): I received notice of this question only a few minutes ago, and I will have enquiries made. I think that the probable explanation of the apparent disproportion is that it is a casualty return covering several days of what we know to be severe and intense fighting by the Royal Flying Corps?

Mr. Churchill: Can my hon. friend say whether, as a matter of fact, there has been an increase in the number of casualties among the Royal Flying Corps during the last month?

Mr. Macpherson: I must have notice of that question.

Mr. Joynton-Hicks: Even if these figures represent a few days, will they not be far in excess of the percentages which the hon. gentleman gave us last week?

Mr. Macpherson: All I can say is that the fighting has been extremely intense during the last few days, and that the number of our Flying Corps officers employed has been greater than before.

Sir Henry Dalziel: Can the hon. gentleman say whether the proportion of casualties at home within the last fortnight has been greater than it has ever been before?

Mr. Billing: Is it not a fact that our casualties are nearly double those suffered by the enemy in the air?

Mr. Macpherson: I cannot admit that.

Mr. Billing: Will the hon. gentleman make a clear statement as to what are our casualties?

## Certified Pilots.

MR. PEMBERTON BILLING on April 3rd asked the Under-Secretary of State for War how many commissioned officers of the Royal Flying Corps are at present attached to Adastral House or the Hotel Cecil; and how many of these are certified pilots?

Mr. Macpherson: The number of commissioned officers of the Royal Flying Corps at present attached to Adastral House and the Hotel Cecil is 207, of whom 29 are certified pilots.

Mr. Billing: In view of the great pressure at the front to get certified pilots, and in view of the sending out of partially-trained men, will the hon. gentleman consider the advisability of sending out some of these certified men?

Mr. Billing asked the First Lord of the Admiralty if he will state how many commissioned officers of the Royal Naval Air Service are at present attached to the Hotel Cecil or the Admiralty; and how many of these are certified pilots?

The Parliamentary Secretary to the Admiralty (Dr. Macnamara): Two hundred and nine commissioned officers connected with the Royal Naval Air Service are at present attached to the Royal Naval Air Department at the Hotel Cecil and the Admiralty, of whom 38 have qualified as pilots, including the Fifth Sea Lord.

Mr. Billing asked the First Lord of the Admiralty what proportion of the certificated pilots in the Royal Naval Air Service are on active service?

Dr. Macnamara: Approximately 84 per cent. of the trained pilots borne are on active service at home and abroad.

## Launching Aeroplanes from Warships.

MR. BILLING asked the First Lord of the Admiralty whether he will consider the advisability of appointing a special committee of experts for the purpose of endeavouring to solve without further delay the problem of launching aeroplanes from and returning to warships under active service conditions?

Dr. Macnamara: The whole question is receiving the most careful consideration.

Mr. Billing: Is the right hon. gentleman aware that the question affects the visibility of the Fleet, and that it has received no serious attention at all for two and a half years, and will he see that it does?

Dr. Macnamara: I have just said it is receiving the most careful consideration.

Mr. Billing: Can he say whether it is satisfactory?

## Raiding Squadron.

MR. BILLING asked the First Lord of the Admiralty whether he will consider the advisability of organising a raiding squadron composed of pilots and machines at present unemployed in this country?

Dr. Macnamara: All the possibilities of employing aircraft are fully considered by those responsible. All the machines in this country have a definite purpose in view.

## Raids Against Enemy Centres.

MR. BILLING asked the First Lord of the Admiralty why it is held to be in the interests of the country to withhold information in connection with the air raids which have been carried out in the past against the enemy centres and submarine bases?

Dr. Macnamara: Communications respecting such raids have from time to time been issued to the Press.

Mr. Billing: Are we to understand that all the raids which have taken place from Dunkirk in the last twelve months have been communicated to the Press?

Dr. Macnamara: I say that communications have been issued to the Press, and I observe that as regards various raids there have been no fewer than twenty-seven.

Mr. Billing: Are we to understand that for the last twelve months a matter of many thousands of machines have only initiated twenty-seven raids?

Dr. Macnamara: I did not say that.

Mr. Billing: Then what are we to understand? I beg to give notice that, owing to the unsatisfactory nature of the reply, I shall raise the whole question of the Naval Air Service on the Motion for the Adjournment for Easter.

## Rigid Airship Trials.

MR. BILLING asked the First Lord of the Admiralty whether the authorities are satisfied with the results obtained at the trial of the new rigid airship which has been constructed for the Royal Naval Air Service?

Dr. Macnamara: It is not considered desirable in the public interest to give any information respecting rigid airships in this country.

Mr. Billing: May I ask if the right hon. gentleman will give serious consideration to the advisability of the cessation of the wasting of public money on these experiments, which cannot be productive in this war?

## Aeroplane's Stability.

MR. BILLING (*by private notice*) asked the Under-Secretary of State for War whether he is aware that the aeroplane known as R.E.8 has proved spirally unstable; whether it is true that while taking deliveries of these machines at Coventry fifteen machines were smashed; whether civilian testing pilots have refused to fly this type of machine; whether it is true that in spite of the fact that this machine has proved a complete failure in France, a contract has been placed for 1,500 of them; and whether, under these circumstances, he is prepared to cancel this order and to withdraw this machine both from active service and in peace time?

Mr. Macpherson: This type of aeroplane has not been proved to be spirally unstable. On the contrary, it has satisfied every test by the Technical Controller since the formation of the Air Board and by the technical experts of the Royal Flying Corps before the formation of the Board. General Brancker, moreover, crossed the Channel on the first machine of this type to go to France. He saw it tested there also, and it is to-day the type of machine which is used by General Trenchard and his staff for their own special work. It is being used with success there, and the Expeditionary Force is asking that the supply may be expedited. In these circumstances, it is not proposed to cancel the orders placed. I am informed that it is not an easy machine to fly, and that it requires the skill of an experienced pilot. I have no knowledge of the refusal of any civilian pilot to fly it, but I think it right to state that some young officers—six, I think—did object to do so. The answer to the second part of the question is in the negative.

Mr. Billing rose—[HON. MEMBERS: "Order! Order!"]

Mr. Deputy-Speaker: If the hon. member remains standing when the Deputy-Speaker is standing, I shall have to ask him to leave the House.

## Martinsyde Aeroplane Company.

MR. T. WILSON asked the Minister of Munitions if he is aware that a woman has been appointed to test the measurements of parts of aeroplanes at the works of the Martinsyde Aeroplane Company; and, if so, what qualifications she possesses that fit her for this position?

Sir W. Evans: The company referred to have two aeroplane works. Seven women viewers of the Aeronautical Inspection Department are stationed at one and one at the other. Women have now been employed in the Aeronautical Inspection Department on the examination of aeroplane parts since July, 1915, and have been found satisfactory for the class of work upon which they are engaged. They work under close supervision, and have no discretion in the carrying out of their instructions.

## R.F.C. Officers' Uniform.

MR. JOYNTON-HICKS on April 4th asked the Under-Secretary of State for War whether an Order has recently been issued, to come into effect on the 15th inst., that all officers attached to the Flying Corps, to whatever regiments they belong, should now wear the double-breasted flying tunic; whether this will put large numbers of officers and parents to considerable and unnecessary expense; and whether he will cause the order to be cancelled, or at all events postponed for further consideration?

Mr. Macpherson: An Instruction has been issued, but it will not be brought into operation for six months. It will not be enforced until an officer has been attached for three months, by which time it will be known whether he is suitable for service with the Royal Flying Corps. So far as officers who are posted direct to the Flying Corps are concerned, there is no question of extra expense, as they would purchase the Royal Flying Corps tunic in the first instance. It is not anticipated, therefore, that any considerable or unnecessary expense will be entailed.

Mr. Joynton-Hicks: Then if they are posted to the Flying Corps from another regiment, they will not get the tunic for nine months?

Mr. Macpherson: Six months.

## R.F.C. Casualties.

MR. WINSTON CHURCHILL, speaking on the motion for the Easter adjournment on April 4th, said: The last illustration I am going to take of the need of Parliamentary attention being concentrated on these topics is the Air Service. The right hon. gentleman quoted a passage from the Official Report in his speech, to the effect that in March, 1916, there was a Parliamentary agitation on the subject of the better organisation of the Air Service. A strong Committee was formed in the House of Commons of members of both sides; the First Lord of the Admiralty was interviewed; a debate was demanded, and at last the late Government decided to act, and they quieted this awkward agitation, by setting up an Air Board, at the head of which was placed Lord Curzon, a member of the War Cabinet to-day. I know the public departments, and especially the greater departments, of this country well, and I know what their attitude is towards the body which has opportunity to severely criticise, to offer advice, and to make complaints, and which have not to bear allegiance and obedience to orders. I said, "Perhaps it will not lead to anything effective, and I say quite frankly that it seems to me that it is likely to lead to a first



class row." am not going to quote my right hon. friend the Chancellor of the Exchequer, and he may put his mind to rest at once.

The Chancellor of the Exchequer (Mr. Bonar Law): Will you give me the volume?

Mr. Churchill: That was a wholly ineffective and valueless proposal for our protection which created high expectations, and Lord Curzon in the House of Lords made a speech on the subject of the Air Board, treating it as if it was a constitutional, new and International Republic. The House was delighted and entirely satisfied, and that put off the whole question. My right hon. friend made the usual appeal about giving new men a fair chance, and so on, and the topic dropped for four or five months, then it became apparent that what had been expected too long did happen. The Admiralty had stifled the Air Board, which had been confined to petty and trivial details. There had been no real grip or control of the Air Service, and as I ventured to predict there had broken out a first-class row between the First Lord of the Admiralty and Lord Curzon. Then, as this became an open scandal when it had become an absolutely open scandal, and feeling that there was to be a first-class row, the Government fell and there was a complete reconstruction. New arrangements were made, but still half-hearted, still imperfect, still vitiated by most serious flaws of administrative principle, and a new Minister was appointed to have a new and fair trial, and I am sorry to say he has been ill nearly ever since. What I may call the "Curzon" period covered some months of vital consequence to the Air Service, and the results of that period are now manifesting themselves.

We are told that our advantage in machines has passed very largely to the Germans. I cannot say whether that is so, but we are told it is. I do not know how that may be, but I have heard from many quarters complaints to that effect. Certain I am of this, that the inferiority is not due to any defect in our pilots. There is no more daring class no more enterprising, no more gifted class of flyers in the whole world than the heroic young men who represent us at the front. But it is freely stated that they are at a disadvantage at the present time in respect of some of their machines, and certainly the casualties have been terribly severe, and out of all proportions to their numbers, and I cannot feel satisfied that they are in proper proportion to the losses suffered by the enemy. But it is not only the question of casualties at the front, but the very large number of casualties that have taken place during training at the present time. Then there is the Royal Naval Air Service, which at present and for a long time past has given no adequate fighting return for the enormous number of pilots and the great proportion of material and skilled labour which it has gathered together, and which has been fettering enterprise. Practically no serious effective measures have been taken against the torpedo bases at Zebrugge, Ostend, and Bruges. I do not hold Lord Curzon to blame for all these results, because he had not the power. If he had possessed the power I have no doubt the results would have been avoided. But I do blame him for taking the responsibility without proper power and authority. It is a very serious thing for a man in the great situation he was and is in this country to take up a position like that when, after all, he had not got satisfactory control and authority, which alone could justify him in assuming this very formidable responsibility. I also blame the House of Commons for relaxing its vigilance, for being so easily put off, for being so easily content to let the question drop without pursuing it and insisting on a periodical discussion of these subjects, many of which no doubt would be much better discussed in private without being reported all over the world. I thank the House very much for having listened to me. I would not have brought these subjects before them if I had not felt that the situation is very serious indeed.

Mr. Bonar Law: The last point raised by my right hon. friend was as to the Air Board. I do not enjoy reading my speeches any more than other hon. members, but I have looked through this one, and I cannot find any of that optimism in it to which he referred. What I pointed out, and it is as true to-day, was that you had to choose between leaving things as they were, between setting up a compromise and trying to get two Departments to work together, and between establishing a fully-fledged Air Board. Of the three I believed then, and I believe now, any attempts to do the last would have caused dislocation of the Service, and was not the best plan. My right hon. friend says the Board has been a complete failure. I say it has not.

Mr. Churchill: In the intermediate stages.

Mr. Bonar Law: Not even in the intermediate stages.

Mr. Churchill: I never said the present Air Board was a failure.

Mr. Bonar Law: If my right hon. friend could see the difference in numbers and the efficiency of the machines and men we have now, as compared with what they were at the end of the last campaign, he would realise that a great deal has been done. It is much too soon to say that the arrangements have been a failure. I may say for myself there is no branch of the Service in which, from the beginning, I have taken so great an interest, and I say this further, we had plenty of warning of the need for more airships, and we should have been much to blame if we had not done all we could to secure them. It is quite true that we have not now the ascendancy which we had at the end of the last campaign, and it is true also the same thing was the case at the beginning of the campaign last year. I think the House of Commons would be wise to wait a little before coming to the conclusion that we may not again completely regain the ascendancy which we had at the end of the last campaign.

Mr. Billing: Can the right hon. gentleman look forward to that with confidence?

Mr. Bonar Law: The hon. gentleman puts to me a question which I will answer at once. I do not say that we can. That depends not only on what we have done but on what the enemy have done. I say we have made great improvements, and whether or not they are adequate events only can show.

Major Hunt: I want to say a few words about our very serious losses in air raids since last October. It is a matter I happen to know something about. Notice was given that this subject would be raised, and I should have been glad if some member of the Government had been here to tell us that things are really being put right at the present time. Up to the middle of October last year the fighting scouts of our Army were about as good as those of the Germans, but about that date Germany brought on the front in France a new fighting scout which has proved very superior to our own. They climb from three or four times higher; they rise up high over the German lines and then dive down on our scouts, thereby gaining an enormous advantage. They are much better and faster climbers, and as they carry two machine-guns, one front and one rear, they send a double stream of bullets out against our machines which admittedly had become obsolete. That accounts to a very great extent for the enormous losses we have sustained among our airmen since that time. The reason for the existence of this state of things is that the late Government refused to give the people who are responsible for the construction of aircraft a free hand. They were so afraid of letting anybody have any power except themselves, and so they did not give as much assistance as they might have done. They were in consequence unable to compete successfully with the Germans, with the result that the German machines are infinitely better than our own, and we have lost so many of our gallant airmen. I understand that the present Government since it came in has done all that it can to help the Air Board. The late Government allowed the difference between the Army and the Navy on this question to go on, and, as a matter of fact, while at that time the Army machine was inferior to that of the

Germans, the Navy machine was quite as good as, if not better than, the German machine.

It must be remembered that this could not have been a good arrangement because the Army was doing very much the most of the fighting. The present Government have been and are doing all they can for the Air Service, and I believe there is now no useless competition between the Army and the Navy. I should like to know if the system has been stopped of ordering a certain number of machines—500 or something of that sort—which through their own fault were very much delayed. When made they were found to be obsolete, but the Government would not scrap them when delivered, and made our men fight on them although better machines were then invented. The War Office made General Henderson head of the Air Service. He admittedly did not know anything about the Air Service at all when he was made head of it. Whether that is a good plan or not may be a matter of argument, but for all I have learned at all events, General Henderson has done his very best. If he is hampered by want of knowledge in having to rely on other people, that is not his fault, but the fault of the late Government for appointing a man as head of a highly-skilled technical arm of which he had no previous knowledge whatever. I do not differ very much from my hon. friend opposite, but I do hope we shall have a statement from the Government that those things are being taken into consideration, and that every effort will be made in future that shall prevent sacrifices of the most gallant men we have got. Let me give an instance that happened last November or December, to show how faulty some of our aeroplanes were. Four machines went out to protect a bombing party of aeroplanes against the German lines. Three of the engines of the four went wrong and stopped, and those had to go back home. In the case of the one man who was leading, the engine did not go wrong, and he had to go on to protect the whole of the bombing aeroplanes. When he was fighting with one of the superior German aeroplanes another German aeroplane came behind him and shot him in his back. He was thus wounded and had to come down in the German lines. That is only a small example of what has happened through not having good aeroplanes. I hope we shall have a statement that things are better than they were in 1916.

Mr. Billing: First of all, I wish to say that I must withdraw, or rather I must ask this House to excuse me, if at any moment I have claimed the right and the privilege of having stated that some of the best men in this country have been murdered by maladministration. I was looking through the Official Report since the last time that I addressed the House, and this is what I find—I have no weakness as a right hon. member said, standing at this box yesterday, for reading my own speeches. I am referring to the Official Report of 17th June, 1913. This is what I find:—

"Captain Faber (Hampshire, W.) asked the Secretary of State for War if he would state whether the responsibility for allowing the aeroplanes that lately led to the deaths of Lieuts. Harrison and Arthur being allowed to fly in their deteriorated condition rested upon the officer commanding the flying wing?"

"Col. Seely: I cannot admit that these aeroplanes were in a deteriorated condition as stated in the question. As regards the first accident, the Cody aeroplane had recently been thoroughly overhauled and returned as being in a safe condition for flying. As regards the second accident, the investigation of the question as to who was responsible for the condition of the wing tip which broke has not yet been completed."

Replying to a question by the noble lord the member for Horsham (Earl Winterton),

"Col. Seely said that most careful reports were furnished when an accident took place, and he deprecated any suggestion that officers did not do their work well. From all the information he had it appeared that they were doing their work admirably and the aeroplanes were in excellent condition."

"Capt. Faber asked whether officers of the Flying Corps did not hold a very different view, and did not some of them hold the opinion that the two officers mentioned were murdered by carelessness."

And that is the historical occasion when the word "murder" was first used in the House of Commons in connection with the maladministration of our Air Service. Therefore, whatever reputation I may have gained in this country or in this House for having used the word "murder" in connection with the Air Service, I am afraid I am doomed to lose it.

In March, 1916, our losses at the front seemed to those of us who were studying the problem closely one of the most serious incidents in this war. It appeared to us all the more serious because it was not a question of numbers. The proportionate number of pilots who were being killed was not so serious in relation to the terrible losses we were sustaining in other branches of our naval and military forces. I know that when I have put forward in this House the argument that 30 or 40 of our pilots had been killed it has been remarked to me "After all, what is that to the 5,000 or 6,000 who are being drained away daily in our military operations on the Western front, to say nothing of our operations in other parts of the world?" But what we have to remember is that the training of a pilot for the purposes of observation and air fighting—and without first-class air fighting pilots we cannot retain the observation pilots—is not only a very difficult but a very long task. Before we can train a man who is fit to do observation or air fighting in France, we first have to get the type of man who is suitable, and to get that type of man we may have to take him from 50. I do not think I am exaggerating when I say that not 25 per cent. of the pilots who go into training are proved to be suitable for either air fighters or observers. Perhaps another 50 per cent. prove suitable for bomb-dropping raids, and the remaining 25 per cent. prove absolutely useless for any active service conditions. What does that mean? It amounts to this, that when we are throwing away a hundred lives, as we have been throwing them away in the case of our first-class observers and air fighters, the efficiency of 400 of our pilots is taken away. The matter is much more serious than hon. members of this House appreciate. The position is this, that if we go on losing pilots, first-class pilots, at the rate we are losing them to-day, the day is not far distant when we shall have no first-class pilots and no first-class observing pilots. What does that mean? It means that our Army on the Western front will be blind, and if our Army is blind we are beaten. If our Army is blind we are at the mercy of the manoeuvres of our enemies, we are at the mercy of their guns, and our own guns which, for the last two years, at least, have not only depended, but absolutely relied on the information supplied to them by the gun-spotting machines, would have to fire blind into the enemy's lines, and would be throwing away all those wonderful munitions which we are making a gigantic sacrifice in this country to produce.

It is more serious and more critical—I am now referring to the Royal Flying Corps—than it was 12 months ago, because the position of the whole of our fighting forces is more critical. We have a bigger Air Service, we have more pilots in the air, we have more aeroplanes at our disposal. But you must remember that 12 months have passed since then, 12 priceless months; millions of bullets have been fired, hundreds of thousands of lives have been lost, and still we are pondering, still we are intriguing, still we are hesitating, and when I think that since I first stood up in this House to raise this question dozens of men, dozens of the most priceless men this war has produced, personal friends of mine, have been killed, have needlessly thrown away their lives through this intrigue and inefficiency, it is difficult to speak without passion.

Mr. Deputy-Speaker: The hon. member has been speaking over half an hour now with considerable repetition. I have twice warned him, and I must now request him to resume his seat.



# Answers to Correspondents.

## Notice to Correspondents in General.

Applications for commissions in the Royal Naval Air Service should be addressed to the Director of Air Services, Admiralty, S.W. The necessary form and conditions of entry can be obtained from the Secretary of the Admiralty.

Applications for commissions in the Royal Flying Corps should be sent to the Director-General of Military Aeronautics, Hotel Cecil, Strand, W.C.

Those who wish to enlist in the R.N.A.S. should apply to the nearest naval recruiting station or to the R.N.A.S. Drafting Office, Crystal Palace, S.E. Skilled mechanics are taken whatever their army classification, but unskilled men are only taken if they are classified B1, B2, or C1.

For enlistment in the R.F.C. apply to Major Mitchell, the Polytechnic, Regent Street, W. Men who are classed B1 or B2 are wanted as armourers, acetylene welders, carpenters, coppersmiths, motor transport drivers, electricians, engineer fitters, watchmakers, instrument repairers, wireless telegraphy, cabinet makers as riggers, tailors as sail-makers, vulcanisers, petrol winch drivers, fitters. Unskilled B1 and B2 men are also wanted for the balloon party and labour section and C2 or C3 men who are tailors and shoemakers. Motor cyclists if with good eyesight are also accepted.

## P. P. C. (Manchester).

The number of revolutions obtainable in a petrol engine depends mainly, one might almost say entirely, upon the design. In rotary engines, where the airscrew is attached directly to the rotating cylinders, or in stationary engines with the propeller mounted on the crankshaft, the speed is usually limited to some 1,200 r.p.m. from considerations of propeller efficiency. In aero engines fitted with reduction gear the speed may be considerably higher; and in racing engines fitted with large induction and exhaust pipe, double valves and large carburettors, speeds of 3,500 r.p.m. have been attained, the power increasing with the speed right up to this point. You will therefore understand that it is impossible to state definitely the speed obtainable with an engine of given power.

## 2nd A.-M. W.R.L.

The formula for the resistance of a flat plate normal to the wind is  $R = KAV^2$ , where  $R$  is the resistance in lbs.,  $A$  is the area of plate in square feet, and  $V$  the velocity in miles per hour. The value of  $K$  in the above equation varies somewhat with the size of the plate, the following values being approximately correct:—

Side of plate in feet.	K.	Side of Plate in feet.	K.
0.5	0.00269	3.0	0.00322
1.0	0.00286	5.0	0.00327
2.0	0.00314	10.0	0.00327

For a plate of area 1 sq. ft. and a velocity of 50 m.p.h. the resistance would therefore be:  $0.00286 \times 1 \times 50^2 = 7.15$  lbs.

## THE QUESTION OF ASCENDANCY.

"The official *communiqué* of Saturday evening contains the greatest aggregate of British and German aerial casualties which I believe have ever been published, as the results of two days' operations," writes Reuter's correspondent at the British Headquarters under Sunday's date. "During April 5th and 6th our airmen caused 15 German machines to crash to the earth, and drove down 31 others under conditions which render it pretty certain that many of these were either destroyed or hopelessly disabled, and the rest of them damaged to some extent. Incidentally I may add that it is the invariable practice of the Royal Flying Corps never to claim that any enemy machine has been shot down or damaged unless the result is beyond doubt. During the same period we lost 28 aeroplanes.

"Taking it as a fundamental principle that war cannot be carried on without losses, the first consideration is as to

L. H. (Wigan).

(1) The length of the "Beta" was, we believe, about 104 ft. (2) Probably the smallest successful airship ever built was the "Willows No. 2," which had a length of 86 ft., a diameter of 22 ft. and a capacity of 21,000 cubic ft. If you are interested in airships you will find a very complete list of particulars in the issue of "FLIGHT" for November 9th, 1916. (3) An airship can rise vertically from the ground owing to the fact that it is lighter than air, and does not, therefore, require any "run" before getting off.

W. F. P. (S.E.).

Wind tunnel tests of the nature you suggest have, as a matter of fact, been carried out both at the National Physical Laboratory at Teddington and by Mons. G. Eiffel at his laboratory at Auteuil.

F. W. L. (Hampstead).

Particulars of these machines must not be published during the war.

A. D. (Shipley).

The size of a wing spar does not only depend on the loading but also on the type of machine. For instance, for a given loading, a machine with only one pair of struts on each side would require stronger spars than would be necessary if two pairs were fitted on each side, other things being equal. You will therefore realise that it is not possible to furnish you with spar dimensions from given figures of loading and chord length only. In our article on "Metal in Aeroplane Construction," no reference was made, when choosing an example of a spar, to the chord length to which it would be applicable. If it had been intended for a chord of 6 ft., as you appear to have presumed, it would indeed have been extraordinarily deep, but if intended for a wing of say 10 or 12 ft. chord the figures are not so absurd. The depth of a spar is, of course, limited by the wing section used, and should always be as great as the section will allow.

V. C. S. A. (Market Bosworth).

You should apply again when you are 17 years and 10 months old. The "Dep." control consists of a wheel mounted on top of an arch, turning the wheel operates the warp or ailerons and rocking the arch backwards and forwards works the elevator.

G. M. R. (Leeds).

If you can read French, a book which should help you is "Notes sur les Helices Aeriennes," written by Andre Gueret, and published by H. Dunod et E. Pinat, Paris, at the price of 9 francs. It is, we believe, one of the best books on the subject from a theoretical and practical point of view.

X. Y. Z. (Glasgow).

"The Aeroplane Speaks," by Capt. H. Barber, would give you the information you require. It can be obtained from "FLIGHT" Office for 7s. post free.

how far such losses are justified by the results attained. On this occasion we find that all the machines had carried the aerial war well over the enemy territory. Some of the combats were actually fought as far back as 50 miles behind the front line. This is essential in order that our artillery and photographic machines may remain comparatively immune to continue their important work closer in. The whole doctrine upon which the British air service works is one of bold offensive. This does not necessarily imply that every flight makes fighting its primary objective. Bombing is an essential feature of aerial warfare, but to carry out this work means invading the enemy zone and courting attack.

"When we talk of aerial ascendancy it is as well to realise just what the phrase means. Ascendancy in aerial warfare purely means the power to carry out at all times any operations which may be decided upon. And this power we



assuredly continue to possess and exercise. It is true that the Germans have entirely reorganised their air service since the battles of the Somme, when they were practically on the defensive throughout, and it would be futile to deny that they are now an efficient and bold body of warriors, who frequently take the offensive, but they never retain their initiative for more than a few days at a time. Given an unbroken spell of fine weather, our airmen are confident of their ability so to demoralise the Boche flyers as virtually to clear the air of them. For the Boche airman is at his best in changeable weather, when he can emerge from the clouds and get away again. He has always shown a lack of staying power when it comes to continuous effort.

"In our service the aeroplane has always been regarded as essentially a weapon of attack and not of defence. The pilot has unlimited manœuvring space, and he knows by experience that, with determination and skill, no number of machines acting on the defensive will prevent him from attaining his objective. Herein lies the true explanation as to why the casualties are bound to appear high, but here again we have an instance of misconception. If a battalion goes into action and accomplishes all that it is set to do at a cost of one quarter of its strength, we deem this a perfectly satisfactory operation of war, but if our airmen achieve a

result which is of infinitely more value to the wider issues of a campaign on the same terms, we are apt to regard the sacrifice as illustrating a most disquieting state of affairs. Then, again, let it not be forgotten that the casualties in the Royal Flying Corps must all be regarded from the relative point of view.

"The number of losses seems to be steadily increasing, but the growth of the service is increasing in probably considerably greater ratio. And because nearly all the gallant victims are officers, the casualty lists arrest more public attention. I find that the pilots and observers who are serving in this country are consistently optimistic, and as a rule express wonderment that people at home should take any other view of the casualty lists of their corps than to appreciate how effectively these demonstrate that they are carrying out their work with complete success. We nearly always gather when one of our machines is brought down that this happens in enemy territory. It is very seldom indeed that we hear of a German aeroplane being brought down in our ground. The distinction does not need labouring. We carry the war to the foe, and oblige him to keep a very large proportion of his best machines and a large number of his anti-aircraft guns well away from the neighbourhood of our troops. The moral effect of this alone is of great value."

## AIR WORK IN THE ADVANCE.

MR. W. BEACH THOMAS, writing to the *Daily Mail* from the War Correspondents' Headquarters on April 3rd, said:—

"I should doubt if our airmen ever combined their functions with more brilliance. While some were finding the targets and reporting them to the artillery, others dived down like hawks and emptied many drums of cartridges into the assembling Germans, whom they could see tumbling over right and left. Very much at the same time another of our fighting planes brought down a German behind our lines, and the pilot and observers are now among the prisoners. In conjunction with the infantry they very nearly succeeded in capturing a battery of German field guns. Nevertheless, the battle is to be regarded as chiefly an infantry battle of which England and Australia should be proud."

Mr. Philip Gibbs, writing to the *Daily Telegraph* on the same day, said:—

"Our aeroplanes were up and circling round, in spite of German shrapnel puffing white clouds about them. They signalled down to our field batteries, and the gunners found the target, this human target, moving between two villages. In the words of one of the officers directing the operation, 'we made a mess of them,' and that is an exact description.

"A second attempt suffered the same fate. Our flying men were more than usually audacious, and stooped low enough to join in the kill, swooping above the heads of the German infantry and playing machine bullets into their mass. Two German flying men were brought down, whether by 'Archies' or an aircraft duel is the subject of rival claims, and were captured alive."

The French expert commentator, writing on April 7th, said:—

"The most striking event of the day was the extraordinary activity in the air. The British and French squadrons effected very numerous bombardments and fights. It seems to be that the greatest battle which has taken place during the war was delivered to-day. The losses of our Allies, who, moreover, announce them with a very sporting honesty and coolness, were appreciable, but they are in proportion to the considerable number of machines which took part in the fight, and to the superior number of enemy machines put out of action. We shall soon see the results of the work of our own airmen and those of our Allies. Aeroplanes, as is known, are the eyes of the artillery."

The *Times* correspondent, writing on April 8th, said:—

"The changed weather has been even more favourable to increased activity in the air than elsewhere. You have heard officially of the tremendous fighting which has occurred, exceeding anything since the beginning of the war, when in two days we drove down 46 enemy machines and 28 of our own were missing.

"As always, the fighting took place far over the German lines. On the other hand, this gives them the advantage of knowing to a certainty the condition of all machines, whether ours or theirs, which are brought down, while we only know which fall, and cannot tell their final fate. Our 28 is the maximum of all our mishaps, while they may have had many catastrophes of which we know nothing, because they could not be observed from above.

"After the winter, with the reorganisation of the German Air Service which has taken place, we knew the enemy would

do his best with the return of spring to regain some share of his lost supremacy. We have shown ourselves ready for him. The aerial war is still in his country, and all his efforts to win the dominion of that field which would give him observation over our lines are futile."

Writing on the same day, Mr. W. Beach Thomas said:—

"Even the amazing *communiqué* issued yesterday gives no real idea of the new fighting in the air. The latest aeroplanes on both sides are of a quite breathless speed.

"The fighting is now so quick and skilful that the slower, older machine has about as much chance as a fieldfare against a hawk. I am told that all records were broken by one of our newest and fastest machines, which destroyed five of the enemy in one flight.

"The art of high diving has increased beyond telling. From 16,000 ft., where they are scarcely visible, or from the ambush of a cloud, the planes come down like a plummet to bomb a train, to fire a balloon, or to riddle a body of men with machine-gun fire. Firing at small objects on the ground is daily practised like the game of tent-pegging. So quickly do the divers come and go that men with loaded rifles on the very spot are often in their astonishment too slow to fire till the plane is well out of range. The German authorities complain bitterly that their infantry fail altogether to use their rifles on such occasions.

"The enemy has concentrated a number of his best airmen, just as earlier he concentrated a group of his best gunners, in what is known as the travelling circus, which gathers wherever he meditates an offensive. It is a mobile unit of expert fighters and photographers.

"The clear air and compact April clouds with well-defined edges give ideal conditions for air manœuvring, and some of the experts on both sides have exhibited almost uncanny skill in ambushing in clouds and escaping back into them. This activity is visible all over the front. The French machines are much admired by our men, who watch their manœuvres in the neighbourhood of St. Quentin.

"We have fought several hot fights as far behind the German lines as Douai, and considerable groups of planes in as regular fighting formation as attacking infantry have both bombed and bombarded much more distant spots."

Writing on Monday, Mr. Philip Gibbs said:—

"It was dawn now, but clouded and storm-swept. A few airmen came out with the wind tearing at their wings, but could see nothing in the mist and driving rain."

Mr. W. Beach Thomas in his despatch said:—

"Near Arras our troops leapt to the attack in the midst of such artillery fire as the world has never seen. It was accompanied by an onslaught of strange engines of war, while overhead, as soon as the clouds allowed, our aeroplanes, moving at 130 miles an hour, rushed to tackle any German machines they could find.

"The battle began, of course, days ago. I had watched our latest aeroplanes go out to sweep the air, and, exulting in flashes of April light that threw into relief every German trench and emplacement, take deliberate photographs of the enemy's lines, new and old.

"Our airmen have never faced a more unfavourable wind, nor so disregarded adverse conditions."





### Casualties.

Second Lieutenant FRANK BOWER, Northumberland Fusiliers, attached R.F.C. (died of wounds received in action on March 31st), was youngest son of Mr. and Mrs. Joshua Bower, of Somerford Keynes, Cricklade, Wilts, and grandson of Mr. Thomas Bower, of Stradishall Place, near Newmarket. He received his commission in August, 1916, and was appointed flying officer in the following December.

Lieutenant CHALONER McCRAE CAFFYN, East Surrey Regiment, attached R.F.C., aged 24, son of the late Stephen Mannington Caffyn and Mrs. Mannington Caffyn ("Iota"), was killed on March 28th. He was educated at Miss Colebrook's School, Southsea, Cheltenham College, and the University, Zurich. He joined the East Surrey Regiment early in the war, and after 18 months' service in the trenches was seconded to the R.F.C. Lieutenant Caffyn played for England in the International Ice Hockey contest in Zurich shortly before the war. His brother, Captain Caffyn, North Stafford Regiment, was killed in France on March 21st, 1915.

Second Lieutenant DOUGLAS B. STEVENSON, Duke of Cornwall's L.I. and R.F.C., youngest son of Mrs. L. R. Stevenson, of Greenwich, and grandson of the late Captain B. Anderson was born in 1895, and educated at Christ's Hospital and King's College School. At the outbreak of war he enlisted, and was subsequently given a commission in the Duke of Cornwall's Light Infantry. He went to the front in July, 1916, and was attached to the Yorkshire Light Infantry. He was transferred to the R.F.C. in February, 1916, and was killed on March 11th.

Lieutenant WILLIAM ELDON CHAPPEL, D.C.L.I., attached R.F.C., who fell on April 4th, aged 19, was the younger son of Mr. Herbert E. Chappel (retired Director of Telegraphs, India-Burma Circle) and of Mrs. Chappel, of 31, Pemberley Avenue, Bedford. He was educated at Bedford Grammar School, where he was a monitor, head of his house (Bromham), and captain of the eight in 1915. He received his commission while at school, and joined the Duke of Cornwall's L.I. in July, 1915, and after a course at Hayling Island joined his battalion in India, where he was machine gun officer to the battalion. He joined the Flying Corps elsewhere early in February, and was accidentally killed while flying. His elder brother, Lieutenant Brian H. Chappel, D.C.L.I., attached Norfolk Regiment, has been twice wounded.

Second Lieutenant ARTHUR DUPPA COLLINS, R.F.C. (died of wounds on April 1st), was 22 years of age and only son of Mrs. W. P. Collins, of Lingfield Avenue, Kingston-on-Thames, and formerly of Beckenham. He received his commission in January of this year.

Second Lieutenant HAROLD WILLIAM TAGENT, R.F.C., "killed in action" in France, March 24th, age 22, was the

only son of Mr. and Mrs. G. A. Tagent, Winchmore Hill, London. He was educated at Cliftonville College, and when war was declared he volunteered for service, joining the Public Schools Battalion. He obtained his commission in the 4th Royal Irish Fusiliers in May, 1915, and was attached to the R.F.C. in February, 1916, when he soon obtained his wings and was sent to the front. His Commanding Officer writes: "He was up taking photographs over the German lines, when he was attacked by a German machine, and after a gallant fight was shot down, both he and his observer being killed, the machine falling on our side of the lines. I cannot possibly express my feeling over this misfortune, as your son was quite my best photographer and one of the most courageous and kind of all my pilots. Both myself and the other officers of your son's flight mourn the loss of a gallant comrade and friend."

Lieutenant ANTHONY ARCHIBALD MURRAY, Canadian Infantry, attached R.F.C., was born in Bangalore, India, and educated at the Royal High School, Edinburgh. He was the younger son of Captain John Murray, R.H.A., and Mrs. Murray, of Gala Bank, Dunbar, and of Edmonton, Canada. After 18 months' service with his regiment Lieutenant Murray returned to England on February 1st last for a short training in the R.F.C., and was killed while flying on March 19th.

### Married and to be Married.

On April 5th, at the Church of St. John the Evangelist, Paddington, Squadron Commander C. H. K. EDMONDS, D.S.O., R.N., was married to LORNA KARIM CHADWICK OSBORN, daughter of Colonel Osborn, Royal Artillery.

On April 19th is to be married at St. Paul's Church, Knightsbridge, S.W., GEOFFREY ERNEST FFISKE, youngest son of Mr. Henry ffiske of Holm Close, Brundall, Norfolk, to ETHEL MARY, only daughter of Mr. ALFRED DANDRIDGE of Brooksleigh, Beckenham.

The engagement is announced of Lieutenant ALAN P. DUNLOP HILL, R.A. and R.F.C., son of the late Mr. and Mrs. Dunlop Hill, London, and NOEL GORDON, youngest daughter of Dr. and Mrs. MOIR, St. Andrews.

Commander CHARLES RUMNEY SAMSON, D.S.O., R.N., second son of Mr. and Mrs. Charles L. Samson, of 2, Montagu Square, W., was on April 7th at Colombo, Ceylon, married to HONOR, only daughter of HERBERT L. STOREY, Esq., J.P., D.L., of Bailrigg, Lancaster.

### Items.

The will of Flight Sub-Lieutenant the HON. ARTHUR CAMERON CORBETT, R.N.A.S. (son of Lord Rowallan) of Hans Place, Chelsea, who was killed in France on December 4th, intestate, has been proved at £268.

### "Mentioned in Despatches."

In the additional list of names published on April 5th of those brought to the notice of the Secretary of State for War for valuable services rendered in connection with the war, the following appeared:—

Lieut.-Col. M. J. P. O'GORMAN, C.B., R.F.C.

### Changes at R.F.C. Headquarters.

In the *London Gazette* of April 10th the following temporary appointments at the War Office were announced:—

*Deputy Director-General.*—Bt. Col. (temp. Brig.-Gen.) W. S. Brancker, R.A., from a Dir., and to retain his temp. rank while so employed (February 28th).

*Director.*—Bt. Lieut.-Col. L. E. O. Charlton, C.M.G., D.S.O., Lan. Fus., from a G.S.O., 1st grade, and to be temp. Brig.-Gen. while so employed, vice Bt. Col. (temp. Brig.-Gen.) W. S. Brancker, R.A. (February 28th).

*Deputy Assistant Director.*—Major and Bt. Lieut.-Col. W. D. Dooner, A. Ord. Dept., from Ord. Officer, 2nd class, and temp. Lieut.-Col. (March 19th).

*Deputy Assistant Adjutant General.*—Lieut. (temp. Major) H. S. Ebben, R.F.C., S.R., from graded as a Park Commander, and to retain his temporary rank while so employed (February 28th).

*Staff Captain.*—Capt. C. F. Gordon, M.C., N. Staff. R., vice Major D. H. Cameron, ret. pay. Ind. Army (February 28th).

### Aerial Battle of Leaflets.

"SOME days ago," writes Reuter's correspondent in Macedonia, on April 3rd, "the Bulgarians dropped the following notice into the Serbian lines:—

"Because of the discontent of the people with the British and French alliance, and also because of the ardent desire for peace, a revolution has broken out in Russia which has overthrown all the authorities and the Tsar."

"The following reply was sent back:—

"We are not unaware of the great changes in Russia, but also know what is hidden from you, that the changes are not the consequences of discontent with England and France, but of the hatred of the influence of Germany, which is now broken for evermore."

"It would appear that the Bulgaro-German authorities are at pains to distort the real significance of the portentous happenings in Russia, and consequently French aviators have dropped fly-sheets with illuminating accounts of the revolution, at the same time calling on the Bulgarian people to imitate Russia's example and shake off the German influence which is leading the country to destruction."



# The British Air Service

"PER ARDUA AD ASTRUM"

## Royal Naval Air Service.

Admiralty, April 3rd.

P. S. Hargreaves granted temp. commission as Lieut., R.N.V.R., seniority April 2nd.

W. F. Higgs granted temp. commission as Lieut., R.N.V.R., and appointed to "President," additional, for R.N.A.S., date April 2nd.

W. H. B. Sandes granted temp. commission as Sub-Lieut., R.N.V.R., and appointed to "President," additional, for R.N.A.S., date April 2nd.

A. Shires entered as Warrant Officer, 2nd grade, and appointed to "President," additional, for R.N.A.S., date Mar. 13th.

B. T. Scott entered as Warrant Officer, 2nd grade, date April 2nd.

Admiralty, April 9th.

T. E. Chrimes entered as Prob. Flight Officer for temp. service, date April 15th.

## Royal Flying Corps (Military Wing).

London Gazette Supplement, April 2nd.

**Flight-Commander.**—2nd Lieut. (Temp. Lieut.) E. K. Anderson, High. L.I. (T.F.), from a Flying Officer, and to be Temp. Capt. whilst so employed; Mar. 17th.

**Flying Officers.**—Temp. Lieut. R. A. Redfern, Gen. List; Feb. 28th. Temp. 2nd Lieut. (on prob.) G. T. Wix, Gen. List; Mar. 8th. Temp. 2nd Lieut. J. S. Heagerty, attd. E. Kent R., and to be transfd. to Gen. List; Mar. 13th. Mar. 14th: Temp. Lieut. A. J. Jessopp, Bedf. R., and to be transfd. to Gen. List; Lieut. R. G. Sillars, W. Rid. R., S.R., and to be secd.; Lieut. C. E. French, Can. Gen. List; 2nd Lieut. F. B. Tipping, R.G.A. (T.F.), from attd. R.G.A., and to remain secd.; Temp. 2nd Lieut. F. J. Woollard, attd. E. Kent R., and to be transfd. to Gen. List.

**Flying Officers (Observers).**—Capt. R. M. Knowles, Norf. R., S.R.; Mar. 11th, seniority May 26th. Oct. 10th: 2nd Lieut. H. E. T. Crocker, Ind. Army Res. of Off., seniority Aug. 14th. Lieut. R. A. Maybery, Lrs., and to be secd., seniority Aug. 21st. Temp. 2nd Lieut. H. Hillier, Hamps. R., and to be transfd. to Gen. List; Feb. 14th, seniority Sept. 15th. 2nd Lieut. E. R. Childe-Freeman, Worc. R. (T.F.), and to be secd.; Mar. 14th, seniority Sept. 29th. Temp. 2nd Lieut. P. L. Goudie, Gen. List; Mar. 12th, seniority Oct. 8th. Jan. 1st, seniority Oct. 10th: 2nd Lieut. (Temp. Lieut.) C. M. Eastley, R.F.A. (T.F.), and to be secd.; 2nd Lieut. D. G. Barnett, R.F.A., S.R. 2nd Lieut. M. G. Sykes, Ind. Army Res. of Off.; Jan. 1st, seniority Oct. 13th. Temp. 2nd Lieut. (on prob.) F. B. Palmer, Gen. List; Mar. 14th, seniority Nov. 13th. 2nd Lieut. W. Moyes, R. Scots (T.F.), and to be secd.; Mar. 11th, seniority Nov. 23rd. Mar. 15th, seniority Dec. 29th: Temp. 2nd Lieut. R. L. Roe, Gen. List; Temp. 2nd Lieut. T. Huggan, Gen. List. Temp. 2nd Lieut. H. S. Cudlip, Notts. and Derby. R., and to be transfd. to Gen. List; Mar. 11th, seniority Jan. 17th. Temp. 2nd Lieut. R. P. M. Whitham, Northd. Fus.; Mar. 13th, seniority Jan. 17th. Mar. 14th: Lieut. H. D. Mason, Can. Pioneer Bn., seniority Jan. 23rd. Lieut. C. N. Bennett, Can. Mach. Gun Corps, seniority Jan. 24th.

**Equipment Officers, 2nd Class.**—Lieut. C. H. Morgan, S.R., from the 3rd Cl.; Feb. 27th.

**3rd Class.**—Mar. 14th: Temp. 2nd Lieut. G. T. Bickerton, Gen. List; Temp. 2nd Lieut. A. V. Boothroyd, Gen. List; Temp. 2nd Lieut. R. E. Cook, Gen. List; 2nd Lieut. W. H. Harrison, Gen. List; Temp. 2nd Lieut. E. Plimley, Gen. List; Temp. 2nd Lieut. E. A. Smith, Gen. List; Temp. 2nd Lieut. R. Wilson, Gen. List; 2nd Lieut. (on prob.) V. F. J. Barker, S.R.; 2nd Lieut. (on prob.) J. P. Clark, S.R.; and Lieut. (on prob.) J. A. G. Harrison, S.R.; 2nd Lieut. (on prob.) A. C. F. Hill, S.R.; 2nd Lieut. (on prob.) Sir C. C. Mansel, Bart., S.R.; 2nd Lieut. (on prob.) C. S. Collingwood, S.R.

**Memoranda.**—The undermentioned 2nd Lieuts., Ind. Army. Res. of Off. to be Temp. Lieuts. whilst serving with R.F.C.:—Feb. 1st: G. F. Welch, E. A. Floyer. Temp. Lieut. Robert Ainsworth Redfern, from R. Mar., to be Temp. Lieut. for duty with R.F.C.; Feb. 28th. The undermentioned to be Temp. 2nd Lieuts. (on prob.) for duty with R.F.C.: Cadet P. E. Negretti; Jan. 17th. W. D. Miller; Mar. 1st. H. S. Wildeblood; Mar. 21st.

London Gazette, April 3rd.

**Squadron Commander.**—Lieut. (Temp. Capt.) G. R. M. Reid, M.C., Arg. and Suthd. Highrs., S.R., from a Flight Com., and to be Temp. Maj. whilst so employed; Feb. 10th.

**Flight Commanders.**—From Flying Officers, and to be Temp. Capt. whilst so employed: Temp. Lieut. P. D. Stuart, Gen. List; Mar. 17th. Temp. 2nd Lieut. J. H. Norton, Gen. List; Mar. 18th. 2nd Lieut. H. H. Baron, S.R.; Mar. 19th. Temp. 2nd Lieut. K. Crawford, Gen. List; Mar. 21st.

**Flying Officers.**—2nd Lieuts., S.R.: H. H. James, J. H. James, L. R. Tait-Cox, J. G. Woodley; Mar. 8th. Mar. 13th: Lieut. R. R. Laing, Canadian Gen. List. Temp. 2nd Lieut. (on prob.) S. B. M. Simpson, Gen. List. Mar. 14th: Temp. 2nd Lieut. T. H. Lines, Gen. List; Temp. 2nd Lieut. (on prob.) F. Fowler, Gen. List; Capt. P. A. Kirkup, Durh. L.I. (T.F.), from a Flying Officer (Observer), seniority Mar. 24th, 1916; Lieut. L. Elsley, Canadian Inf. Bn.; Temp. 2nd Lieut. W. P. MacD. Brettell, Durh. L.I. and to be transferred to Gen. List; 2nd Lieut. R. M. Anderson, High. L.I. (T.F.) and to be secd.; 2nd Lieut. R. H. Norton-Dawson, S.R.; Temp. 2nd Lieut. (on prob.) K. W. Bransby, Gen. List; Temp. 2nd Lieut. (on prob.) C. A. Hyde, Gen. List. Mar. 15th: 2nd Lieut. (on prob.) L. L. Morgan, Welsh R. (T.F.), and to be secd.; 2nd Lieut. R. G. Dalziel, S.R.; and Lieut. G. B. Barker, R. War. R. (T.F.), and to be secd.; Temp. 2nd Lieut. A. C. Sanderson, Gen. List. Temp. 2nd Lieut. G. R. G. Smeddle, Gen. List; 2nd Lieut. (on prob.) A. S. Shepherd, S.R. Temp. 2nd Lieut. L. V. Marchant, Res. Regt. of Cav., and to be transferred to Gen. List; Mar. 16th. 2nd Lieut. (on prob.) G. Colledge, Yeo. (T.F.), and to be secd.; Mar. 17th.

**Equipment Officers, 3rd Class.**—Temp. 2nd Lieut. (on prob.) J. R. Evans, Gen. List; Sept. 18th. Mar. 14th: 2nd Lieut. (on prob.) A. Graham, S.R.; 2nd Lieut. (on prob.) E. McR. Cockell, S.R.; 2nd Lieut. E. L. M. Emtage, S.R.; 2nd Lieut. G. Kitchin, S.R.; Temp. 2nd Lieut. A. J. Annandale, Gen. List; 2nd Lieut. H. Chapman, S.R.; 2nd Lieut. (on prob.) J. F. Crichton, S.R.; 2nd Lieut. F. A. Roberts, S.R.; 2nd Lieut. L. Tunks, S.R.; 2nd Lieut. (on prob.) R. D. Whitt, S.R.; 2nd Lieut. P. Ogden, S.R.; 2nd Lieut. E. J. Dowty, S.R.; 2nd Lieut. R. A. G. Shepherd, S.R.; 2nd Lieut. A. S. G. Smith, S.R.; 2nd Lieut. (on prob.) C. Q. Steel, S.R.; 2nd Lieut. L. R. J. Williams, S.R. Temp. Capt. R. G. Taylor, K.R. Rif. C., and to be transferred to Gen. List; Mar. 16th.

**Memoranda.**—The undermentioned to be Temp. Capt.: 2nd Lieut. P. H. R. Whittet, R.F.C., Spec. Res., whilst specially employed; April 4th, 1917. The undermentioned 2nd Lieuts. to be Temp. Lieuts. whilst serving with R.F.C.: A. V. McKiever (now Lieut.), Sea. Highrs.; Aug. 11th. B. H. E. Howard, Manch. R., S.R.; Oct. 2nd. L. V. Drake, Yeo. (T.F.); Jan. 1st. Feb. 1st: M. L. Maguire, Conn. Rang.; J. S. Windsor, S. Wales Bord.; L. W. Waddell, Essex R., S.R.; R. W. Morison, Yeo. (T.F.); F. P. Scott, Yeo. (T.F.). March 1st: H. W. B. Rickards, R.F.A.; E. Harling, N. Lan. R. (T.F.). The undermentioned Temp. 2nd Lieuts. to be Temp. Lieuts. while serving with R.F.C.: A. E. Kennedy; Aug. 26th. Feb. 1st: H. C. Roberts, E. A. Cleaver. March

1st: J. H. Tyler, E. Newling, W. Bagnall. The undermentioned to be Temp. 2nd Lieut.: R. M. Brown, for duty with R.F.C.; March 16th.

**Supplementary to Regular Corps.**—2nd Lieut. (on probation) W. G. Peck relinquishes his commission on account of ill-health; Apr. 4th. 2nd Lieut. F. H. Stone relinquishes his commission on account of physical unsuitability as a flying officer; Apr. 4th. The undermentioned 2nd Lieuts. (on probation) are confirmed in their rank: T. D. Bucknill, R. R. Byrne, V. F. J. Barker, J. P. Clark, G. R. Cobb, H. Chapman, R. G. Dalziel, E. J. Dowty, F. Dugdale, C. M. De Rochie, E. L. M. Emtage, H. G. Etheridge, J. A. G. Harrison, A. C. F. Hill, W. T. Hanson, W. C. Hacon, F. H. Isitt, G. Kitchin, R. H. Norton-Dawson, F. B. Nicol, P. Ogden, A. H. Peake-Jones, S. H. Roberts, F. A. Roberts, A. S. G. Smith, R. A. G. Shepherd, L. R. J. Williams, L. Tunks. The undermentioned to be 2nd Lieuts., Mar. 8th: Henry Howard James, John Herbert James, Leslie Robert Tait-Cox, John George Woodley. The undermentioned to be 2nd Lieuts. (on probation): 2nd Lieut. Keith Leslie Mackenzie, Austr. Imp. Force; Feb. 6th. John Fifield Adaye; Mar. 21st. The appointment of 2nd Lieut. (on probation) William Harold Griffith, notified in the Gazette of Feb. 23rd., is post-dated to Mar. 9th.

London Gazette Supplement, April 4th.

Temporary Appointments at War Office.

**Staff-Lieut.**—2nd Lieut. H. G. Day, R.F.C., S.R., vice Lieut. (Temp. Capt.) G. Dugdale, Yeo. (T.F.); Mar. 8th.

**Flight-Commanders, from Flying Officers, and to be Temporary Captains whilst so employed.**—Mar. 20th: Lieut. E. E. Hodgson, S.R., with seniority from Jan. 1st, 1916, without the pay prior to Mar. 20th. Temp. Lieut. H. E. Bagot, Gen. List.

**Flying Officers.**—Mar. 16th: 2nd Lieut. (Temp. Lieut.) A. Burbury, M.C., York. R., from a Balloon Officer; 2nd Lieut. (Temp. Lieut.) A. P. Long, Middx. R. (T.F.), and to be secd.; Temp. 2nd Lieut. W. A. Wright, Leicester R., and to be transferred to Gen. List; Temp. 2nd Lieut. (on probation) J. Johnstone, Gen. List.

**Balloon Officer.**—Temp. Lieut. H. Hadley, Gen. List; Jan. 10th. **Equipment Officers, First Class.**—2nd Lieut. (Temp. Lieut.) W. M. Cumming, S.R., from the 2nd Cl., and to be Temp. Capt. whilst so employed; Mar. 8th. **Second Class.**—2nd Lieut. K. Arnold, S.R., from the 3rd Cl., and to be Temp. Lieut. whilst so employed; Mar. 1st.

**Third Class.**—Mar. 6th: 2nd Lieut. T. D. Bucknill, S.R.; 2nd Lieut. R. R. Byrne, S.R.; 2nd Lieut. G. R. Cobb, S.R. Mar. 14th: 2nd Lieut. F. Dugdale, S.R.; 2nd Lieut. H. G. Etheridge, S.R.; 2nd Lieut. W. C. Hacon, S.R.; 2nd Lieut. F. H. Isitt, S.R.; 2nd Lieut. F. B. Nicol, S.R.; 2nd Lieut. A. H. Peake-Jones, S.R.; Capt. O. M. Greg, R. War. R. (T.F.), and to be secd.; Temp. 2nd Lieut. H. Franklin, E. Surr. R., and to be transferred to Gen. List; 2nd Lieut. J. J. Lynch, S.R., from a Flying Officer; Temp. 2nd Lieut. C. R. H. Trevor, Gen. List; Temp. 2nd Lieut. (on probation) A. D. Napier, Gen. List. Temp. 2nd Lieut. (on probation) R. F. Malabar, Gen. List; 2nd Lieut. W. Thorne, Gen. List; Temp. Capt. T. Ellis, attd. Arg. and Suthd. Highrs., and to be transferred to Gen. List; 2nd Lieut. L. J. Jones, Lond. R. (T.F.), and to be secd.; Temp. 2nd Lieut. J. R. Paris, M.C., Durh. L.I., and to be transferred to Gen. List; 2nd Lieut. S. Davis, S.R.; 2nd Lieut. F. J. B. Powell, Gen. List; Temp. 2nd Lieut. (on probation) E. C. Ponking, Gen. List.

**Memoranda.**—Sub-Lieut. Herbert Hadley, from R.N.V.R., to be Temp. Lieut. for duty with R.F.C.; Jan. 10th. Sergt. J. Hooper, from R.F.C., to be Temp. 2nd Lieut. for duty with the Mil. Wing of that Corps; Jan. 27th. (Substituted for the notification in the Gazette of March 13th). The undermentioned from R.F.C. to be Temp. 2nd Lieuts. for duty with the Mil. Wing of that Corps: Flight Sergt. G. Baillie; July 2nd. Sergt. J. Leask (since killed); Feb. 24th. The undermentioned to be Temp. 2nd Lieuts. (on prob.) for duty with R.F.C.: The Rev. R. M. Banks-Jones, late Temp. Chaplain; Mar. 21st. A. J. Bright; April 5th.

**Supplementary to Regular Corps.**—The undermentioned 2nd Lieuts. to be Lieuts.: (Temp. Capt.) E. L. Millar; July 15th. E. A. Richards; Aug. 30th. J. M. Furnival; Jan. 1st. H. H. Baron; Feb. 1st. The date of the appointment of 2nd Lieut. H. H. Chivers is Dec. 4th, and not as in the Gazette of Jan. 30th. The undermentioned 2nd Lieuts. (on prob.) are confirmed in their rank: F. J. Buckland, S. Davis, A. B. Raper, F. E. Moir Bussy to be 2nd Lieut. (on prob.); Mar. 9th.

London Gazette Supplement, April 5th.

**Flying Officers.**—Temp. 2nd Lieut. (on prob.) W. Turnbull, Gen. List, 10th Mar. Temp. 2nd Lieut. (on prob.) F. Matthews, Gen. List, Mar. 15th.

**Flying Officers (Observers).**—Mar. 19th: Temp. 2nd Lieut. (on prob.) P. S. Taylor, Gen. List, seniority Nov. 14th; 2nd Lieut. A. C. Hendry, M.C., Gord. Highrs., T.F., and to be secd., seniority Nov. 17th; Temp. Lieut. R. O. Williams, R.W. Fus., and to be transfd. to Gen. List, seniority Nov. 18th; 2nd Lieut. L. E. Allan, Yeo., T.F., and to be secd., seniority Nov. 23rd. Mar. 17th: Temp. Lieut. R. D. Caley, E. York. R., and to be transfd. to Gen. List, seniority Nov. 26th; Temp. 2nd Lieut. (on prob.) E. C. Morris, Gen. List, seniority Nov. 28th. Mar. 19th: Temp. Capt. L. E. Claremont, Gen. List, seniority Dec. 23rd. Temp. 2nd Lieut. C. Mackintosh, Gen. List, seniority Dec. 24th. Mar. 19th, seniority Jan. 25th: Temp. Lieut. H. D. Blackburn, R. Berks. R.; 2nd Lieut. A. Roberts, Welsh R., T.F., and to be secd. Mar. 16th, seniority Jan. 25th; Temp. 2nd Lieut. C. D. Knox, attd. Suff. R. and to be transfd. to Gen. List; Temp. 2nd Lieut. (on prob.) H. E. Ward, Gen. List. Temp. 2nd Lieut. N. Couve, Gen. List, Mar. 19th, seniority Jan. 30th.

**Adjutant.**—Lieut. C. G. Beatson, Middlesex Regt., S.R., vice 2nd Lieut. A. H. Stradling, Gord. Highrs., T.F., Feb. 8th; Temp. Capt. C. J. Foot, R.A., vice Capt. R. J. H. Purcell, K.R. Rif. C., 23rd Feb.

**Equipment Officers, 2nd Class.**—2nd Lieut. A. D. Spiers, S.R., from the 3rd Class, and to be Temp. Lieut. when so empld.; Jan. 21st. 2nd Lieut. (Temp. Lieut.) G. E. Godsave, Lond. R., T.F., from a Flying Officer (Observer), and to retain his temp. rank while so empld.; Feb. 14th. Temp. 2nd Lieut. A. E. S. Storey, Gen. List, from the 3rd Class, and to be Temp. Lieut. whilst so empld.; Feb. 19th.

**3rd Class.**—2nd Lieut. R. H. Bright, Gen. List; 24th Jan. 2nd Lieut. (on prob.) F. J. H. Palmer, S.R.; Mar. 12th. 2nd Lieut. (on prob.) C. H. Sharpe, S.R.; Mar. 22nd. Mar. 23rd Capt. A. W. Ruthven-Stuart, Gord. Highrs., T.F., from a Flying Officer; 2nd Lieut. (Temp. Lieut.) J. R. Prophet, Div. Cyclist Cos., Div. Mtd. Troops, T.F., and to be secd.

**Memoranda.**—Acting Sergt-Major R. J. Sladden, from R.F.C., to be 2nd Lieut. for duty with R.F.C. April 6th. To be Temp. 2nd Lieuts. (on prob.) for duty with R.F.C.: K. B. Mackenzie; Feb. 5th. Lieut. A. H. Gearing, S. Afr. Mtd. Rif.; Mar. 23rd. April 5th: F. G. Sherlock, H. W. Halifax, E. C. Steel, E. H. Hart.

**Supplementary to Regular Corps.**—The undermentioned to be 2nd Lieuts. (on prob.), April 5th: A. G. A. Bute, R. Bassett, R. T. Belville, F. W. Brooks, R. O. Clark, F. D. Crane, G. M. Edmondston, F. Freeman, J. C. Keen-Hargreaves, G. A. Harry, H. W. Henchie, J. Hobbs, H. Jaffe, F. W. Memory, T. E. Mills, H. H. Maudsley, T. J. Organ, L. C. Owen, W. H. Stirling, T. P. Shillecock, H. R. Williamson.



## THE USE AND ABUSE OF STEEL.\*

WHERE weight-saving is essential, the designer is constantly keeping in mind the necessity for strength combined with lightness and durability; it follows, therefore, taking a typical example, that the quality of steel used in aeroplane and aeroplane engine construction must necessarily receive very close attention. In the earlier days the Royal Aircraft Factory rendered the greatest of services in instituting detailed specifications for aircraft steels. Prior to this date the complete range of alloy steels had not been fully used for parts requiring great strength with a minimum of weight.

In many cases, firms engaged in the construction of aeronautical components had practically no knowledge of the treatment of special alloy steel. As matters progressed it was found from experience that some of the conditions required by the Royal Aircraft Factory specifications had to be altered and improved. Such progress was inevitable with the great increase of output in the earlier stages of the war.

The progress of the various manufacturers was very carefully watched, and every endeavour was made to assist them to promote and encourage developments. The object of this paper is to place on record some of the troubles experienced in the earlier days, and to a certain extent to-day.

A year or so ago very few firms (excepting in the Sheffield district) possessed heat-treating appliances of their own. Many plants have since been laid down, and this is specially the case in the Birmingham and Coventry districts. It is not, however, sufficient to build a heat-treating plant; it is essential to be able to use it correctly. At the present time this is a cause of a considerable amount of difficulty, in that it is almost impossible to obtain men with the requisite knowledge. A further consideration is that when steels are

lower figures are required it remains a steel-making problem, and there is no doubt a straight nickel steel will fulfil them. It remains, therefore, for the steel maker to say which, irrespective of cost, he can most regularly produce with the least scrap.

There is one question, however, in the choice of a steel by composition that requires consideration, and that is its resistance to abrasive wear. Experience has shown that a relatively high nickel steel does not resist abrasion as well as a low nickel steel with low chromium. On the other hand, the very low nickel, high chromium steel is objectionable owing to its liability to defects in the form of cracks.

It is essential that very close touch be kept between the steel maker and the steel user, and lack of this co-operation has led to many costly mistakes. In many cases it is not recognised that a few degrees in temperature one way or the other may spoil a good steel. It is not sufficient for a firm to install a heat-treating plant with the latest type of pyrometer, and then sit down and allow a semi-skilled man to do the rest. For instance, a firm recently expressed pride in their heat-treating plant and pyrometric installation, whereas observation of the interior of their furnace during a heat showed that the temperature was obviously considerably in excess of that recorded by the pyrometer. On examination the pyrometer was found to be incapable of reading higher than 440° C., although the scale extended to over 1,000°.

In pre-war days it was the custom in a number of cases for firms who are now producing aeronautical components, to leave any process which required the steel to be heated in the hands of a glorified foreman blacksmith. Many of these men are most excellent and worthy individuals, but they were brought up on wrought iron, they learnt a little about mild steel, disliked what they had learnt, and considered that as long as a part was finished at cherry red or perhaps even a little hotter, it could be thrown on a cold plate or left to its own devices to cool.

A great deal of delay in production, waste of material and financial loss is undoubtedly caused by want of metallurgical knowledge on the part of some designers. Certain losses both in time and money have also occurred owing to manufacturers not realising that alloy steels require more careful handling than a carbon steel. For example, the machining

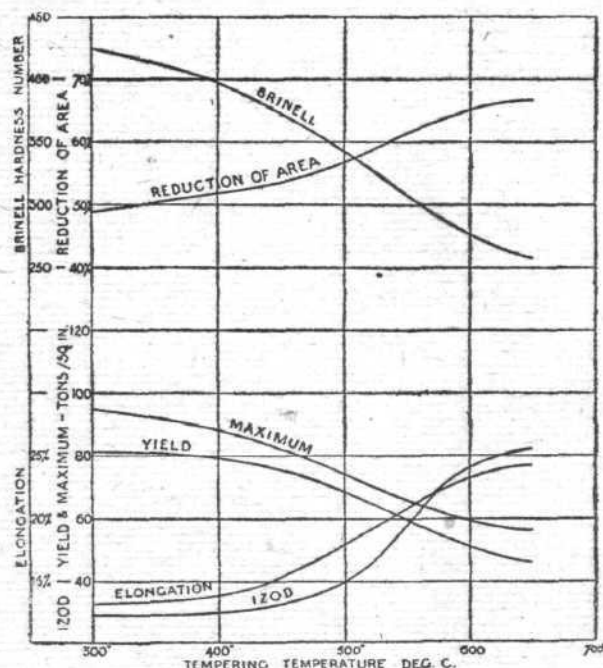


Fig. 1.

classified according to their mechanical properties, independent of chemical compositions, each composition requires a different heat-treatment.

Two steels differing widely in composition may, by different heat-treatments, be made to give the same physical test results. An example of two such steels is as follows:—

C.	Si.	Mn.	S.	P.	Ni.	Cr.	Va.
0.400	0.130	0.570	0.030	0.020	0.070	1.000	0.320
0.284	0.035	0.375	0.014	0.031	5.070	0.434	Nil.

Again, it is not generally realised that an alloy steel can be made to give physical tests covering a wide range by variation of heat-treatment. For example, a steel of the composition:

Carbon	..	..	..	0.3 to 0.4 per cent.
Silicon	..	..	..	0.05 to 0.1 "
Manganese	..	..	..	0.4 to 0.6 "
Sulphur (not exceeding)	..	..	..	0.04 "
Phosphorus (not exceeding)	..	..	..	0.04 "
Nickel	..	..	..	3.0 to 3.75 "
Chromium	..	..	..	0.75 to 1.2 "

may be expected to give the results as in Fig. 1 after hardening from 820° C. and tempering from the temperatures shown.

This range of results is very wide; consequently when the

\* A Paper read before the Institution of Automobile Engineers by Lieut.-Col. R. K. Bagnall-Wild and Lieut. E. W. Birch.

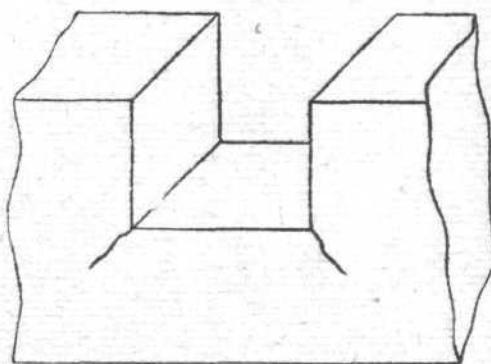


Fig. 2.

of some crankshafts, rough machined prior to heat-treatment, was in one instance very rough and left many jagged edges and sharp corners. On heat-treatment, these crankshafts developed serious cracks at 45 degrees to the angle of the web and the axis of the pin (see Fig. 2). At first the steel was blamed, next the heat-treatment, but finally, after a considerable loss in cranks had occurred, the real truth was found out, namely, that during heat-treatment the cracks started from the rough and jagged edges at the corners of the web and the pin. With a little more co-operation between the manufacturer and the steel maker, and greater metallurgical knowledge on the part of the manufacturer, these losses and the delay in production they involved could have been prevented.

(To be continued.)

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### Steels Used in Aero Work.

At the meeting of the Aeronautical Society on Wednesday, next, April 18th, Dr. W. H. Hatfield, of the Brown-Firth Laboratory, Sheffield, will lecture on "Steels used in Aero Work." The meeting will be held at the Royal Society of Arts, John Street, Adelphi, commencing at 8 p.m., and anyone interested can obtain tickets from the Secretary at 7, Albemarle Street, W.



# AIRCRAFT WORK AT THE FRONT.

## OFFICIAL INFORMATION.

### British.

*General Headquarters, April 3rd.*

"Two German aeroplanes were brought down by gunfire yesterday, one of which fell in our lines. In air fights four German machines were brought down and two others were driven down damaged. Six of our machines are missing."

*General Headquarters, April 4th.*

"There was considerable activity in the air yesterday, and a number of fights took place, in the course of which one German aeroplane was brought down. Five of our machines are missing."

*General Headquarters, April 6th.*

"Yesterday, and on the night of the 4th and 5th inst., several long-distance raids were carried out by our aeroplanes, and a number of important railway junctions, munition depôts, and aerodromes were successfully bombed."

*General Headquarters, April 7th.*

"During the days and the nights of the 5th-6th aeroplanes have been very active, continuously harassing the enemy's communications a long way in the rear and seeking out his fighting machines at a considerable distance behind his lines. Large tracts of the enemy's country many miles in the rear were photographed, over 1,700 photographs being taken behind the enemy's lines."

"Co-operation with artillery continued during daylight unhindered, except by weather, although repeated attempts were made by the enemy to prevent this important work."

"Seventeen successful bomb raids were carried out on enemy aerodromes, ammunition depôts, and railways, a long distance behind the lines, in addition to numerous small raids; a total of over eight tons of bombs were dropped."

"All the time intense fighting between large formations took place. Our casualties are 28 machines missing, a large number of which are known to have been shot down over the enemy's country."

"It is known that the enemy suffered very heavy casualties. In one case an observer was seen to fall out of his machine, which went down out of control in a spin, and in another the fighting was so close that the enemy pilot was seen to fall forward, his machine nose diving out of control. Fifteen hostile machines were driven down and actually seen to crash, while 31 were driven down damaged, a very large proportion of which must have been totally destroyed. In addition two hostile balloons were brought down in flames."

*War Office, April 7th.*

"Salonica.—During the past week our aircraft has continued to show much activity. Naval and military machines, descending to 400 feet, have bombed on several occasions the enemy aerodrome and ammunition dumps of Hudovo. Fires were observed to break out, and considerable damage was inflicted."

*General Headquarters, April 8th.*

"Several bombing raids were carried out by our aeroplanes yesterday and during the previous night. Large quantities of explosives were dropped on aerodrome stations, transport, and on a battery in action, and good results were observed. In one German aerodrome three hangars were destroyed, and possibly a fourth, and a group of buildings in the neighbourhood were also hit by our bombs."

"Hostile trains were also attacked with success by machine-gun fire. A German kite balloon was successfully attacked and destroyed."

*General Headquarters, April 9th.*

"The aerial activity of the past few days was continued yesterday with great energy. Several successful bombing raids were carried out by us, and our machines co-operated with our artillery, with excellent results. Two hostile machines were destroyed, and 15 others were driven down, and probably crashed. Two German kite balloons were brought down in flames. Ten of our aeroplanes are missing."

### French.

*Paris, April 2nd.*

"A German aeroplane was brought down about half-past three in the Rambervillers district."

"Salonica.—There is no important event on the Macedonian front. Behind the lines enemy aviators shelled the hospital of Eksison. This is the fifth time in the space of a month that the enemy has attacked our army medical establishments, although their character is apparent to his aviators by reason of very plain red crosses. Among the victims are twenty Bulgarian soldiers."

*Paris, April 4th.*

"Salonica.—British aviators successfully bombed the sheds at Mudros, causing explosions and fires."

*Paris, April 6th.*

"In the course of the day our aeroplanes destroyed two German captive balloons."

*Paris, April 7th.*

"On Thursday night one of our air squadrons made seven sorties and dropped 440 kilograms of explosives on the enemy's establishments at Damvillers, Spincourt, the Forest of Maugienne, and the Bili Wood. German aeroplanes last night dropped several bombs in the region of Nancy. There were no losses, and no damage was done."

*Paris, April 8th.*

"Last night German aeroplanes dropped bombs on Belfort, which caused neither casualties nor damage."

*Paris, April 9th.*

"Salonica.—A German aeroplane was brought down to the south of Lake Doiran, and two officers and one mechanic were taken prisoner."

### Russian.

*Petrograd, April 3rd.*

"Black Sea.—On March 27th, during a raid by our seaplanes on Derkas, one of them was hit by the enemy. The petrol tank being punctured, the machine was compelled to descend. The aviators, Lieut. Sergeev and Sub-Lieut. Tur, seeing a Turkish schooner, attacked it, opening machine-gun fire. The crew thereupon left the schooner. Our aviators, having sunk their machine after taking from it the compass, machine-gun, and valuable belongings, boarded the schooner, and set sail to our shores. They encountered a heavy storm during their adventure, but arrived with the schooner at the Djarligatch Peninsula (west of Perekop) on April 1st. From this place our aviators returned to Sevastopol on a torpedo-boat. The only provisions available on the schooner consisted of a few pieces of bread and a little fresh water."

*Petrograd, April 5th.*

"On April 4th, at 6 p.m., the enemy opened heavy artillery fire on the sector of Peniaki, Tchepeli, Zvishen (in the Zolotcheff direction), bombarding the first and second line trenches, and also the whole of the rear. The firing was directed by aeroplanes, which were also dropping bombs. At 7 p.m. the enemy delivered an attack on the village Tchepeli, which was beaten back by our fire."

*Petrograd, April 6th.*

"Western Front.—Ten of our aeroplanes made a flight in the direction of Sokal, and dropped bombs on the station depôts of the railway in the neighbourhood of the village of Kutty (south-west of Svinichy), and also on several other points occupied by enemy troops."

"Roumanian Front.—French aeroplanes twice bombarded the enemy's battery north of the village of Garvan (Dobrudja). On the rest of the front aerial activity and rifle firing have taken place."

"Black Sea.—Our seaplanes, under fire from the enemy's battery, carried out an aerial attack on the Bosphorus. Having successfully dropped bombs on the fortifications all our machines returned to their vessels, the latter being attacked by enemy aeroplanes. One of our machines, under the direction of Naval Sub-Lieutenant Kulevitch, with Observer Lieutenant Ostrogradski, engaged in six aerial encounters. In spite of having the motor damaged by enemy bullets during the third engagement, the machine remained in the air, and on three occasions drove away the enemy's aeroplane which attempted to approach our vessels. Altogether our machine received 28 punctures."

### Italian.

*Rome, April 5th.*

"Last night enemy aircraft dropped bombs on the zone along the coast between Mrado [Grado, mouth of the Isonzo] and Monfalcone, causing a little damage to some private houses. In retaliation our seaplanes immediately bombarded the aviation ground at Prosecco (Gulf of Trieste) and the Austrian Lloyd buildings near Trieste."

*Rome, April 8th.*

"Last night some of our aeroplanes dropped about a ton of explosives on the hutments and depôts near Rifemberg and Mecari, in the Branizza Valley (Frugido). In spite of heavy fire from hostile anti-aircraft batteries, our machines returned safely. This morning a squadron of enemy seaplanes carried out a raid on the Monfalcone area; one of them was hit by our artillery and fell in the vicinity of Casaghamo. Both aviators were killed."

### Roumanian.

*Jassy, April 7th.*

"French aviators twice dropped heavy bombs on the enemy's batteries on the same hill."



**German.**

*Berlin, April 3rd.*  
 "In aerial fights the enemy lost four aeroplanes. Colonel Baron von Richthofen brought down two of this number."

*Berlin, April 4th.*

"Nine enemy aeroplanes and two captive balloons were shot down by our airmen."

"*Macedonian Front.*—Our aerial squadrons extensively bombed the railway station of Vertekop (south-east of Voden). We secured photographs of the conflagrations caused by our bombs."

*Berlin, April 6th.*

"Clear weather, during both the day and the night, resulted in very lively reconnoitring and attacking activity on the part of airmen, and numerous aerial combats. A British squadron, consisting of four aeroplanes, which had advanced as far as Douai, was chased by one of our chaser echelons and destroyed. All four machines now lay behind our lines. Lieut. Baron von Richthofen brought down two of them, thus making the 35th and 36th enemy machines which he has accounted for. Apart from these four machines the enemy lost eight aeroplanes, two of which were shot down from the ground. Three of our aeroplanes are missing."

"*Balkans.*—In the Vardar Valley extensive munition depôts were blown up by means of bombs dropped by our airmen."

*Berlin, April 7th.*

"Batteries, ammunition dumps, and works of fortification in Rheims, the existence of which has been revealed by photographs taken by our airmen, together with collections of troops which had been observed in the same city, were brought effectively under our fire."

"With the objects of securing artillery observation and aerial reconnaissance, the enemy collected and used strong aerial forces. They suffered heavy losses. Several units belonging to the enemy squadrons may be regarded as having been destroyed. Lieut. Voss shot down his 24th enemy aeroplane, and Lieut. V. Bertrab his fourth opponent, during aerial engagements. Between Soissons and Rheims the enemy undertook a concerted attack against our captive balloons on this front. By prompt anti-aircraft fire and

participation by our chaser echelons, the enemy failed to achieve the success he anticipated, and only two of the balloons were shot down. The observers landed by parachute.

"Yesterday the enemy lost 44 aeroplanes, 33 in aerial engagements, eight by anti-aircraft fire, and three by forced landings behind our lines. The enemy also lost a captive balloon by an aerial attack. Five of our airmen have not returned."

*Berlin, April 8th.*

"Yesterday 12 enemy aeroplanes were shot down in aerial battles and one by anti-aircraft fire. The anticipatory development of our aerial fighting forces, the perfection in the building of aeroplanes on the basis of experience gained from the enemy and at home, the tutoring of observers for artillery and infantry, and the maintenance of the established attacking spirit of our fighting aviators have led to great results during March. In securing these results our anti-aircraft guns also played a considerable part."

"Our opponents, including the Americans who were in the French aerial service for a long time prior to their country's declaration of war, have lost in the West, East, and in the Balkans 161 aeroplanes and 19 captive balloons by our attacks and anti-aircraft devices. Of these 143 aeroplanes and the 19 balloons were shot down in aerial attack and 15 aeroplanes were shot down by fire from the ground. Three enemy aeroplanes came into our possession by involuntary landing behind our lines. The German losses amount to 45 aeroplanes. No captive balloons were lost."

*Berlin, April 9th.*

"Yesterday 17 enemy aeroplanes and two captive balloons were brought down by our airmen and anti-aircraft guns. Cavalry Captain Baron von Richthofen was victorious for the 38th and 39th times in aerial battles. Lieut. Schäfer brought down his 12th machine."

**Austrian.**

*Vienna, April 9th.*

"Enemy aeroplanes have dropped bombs on Sistiana (between Monfalcone and Trieste) without causing damage. Soon afterwards Austrian aeroplanes attacked the enemy barracks at Vermigliano and dropped bombs on them with success, but one is missing."

**The Death of Mr. Horace Short.**

AVIATION mourns another of its pioneers in Mr. Horace Short, who passed to his rest on Good Friday, at the early age of 44, at his residence in the Isle of Sheppey. In conjunction with his brothers, Eustace and Oswald, who were balloon makers to the Royal Aero Club, in 1909 Horace Short, after an adventurous engineering career, started an aeroplane factory at Shellbeach, Isle of Sheppey. There the inventive genius of Mr. Horace Short brought forth several experimental machines for, among others, Mr. Frank McClean, the late Hon. C. S. Rolls, the Hon. Maurice Egerton, the late Mr. Cecil Grace, Mr. Alec Ogilvie and Mr. J. T. C. Moore-Brabazon, whose Green-engined Short biplane won the £1,000 offered by the *Daily Mail* for the first circular mile flown in an all-British aeroplane. Among other noteworthy machines built by the firm were a number fitted with two engines, and a lengthy series of experiments were carried out with various arrangements of two and three propellers. Mr. Horace Short also designed a large seaplane, with folding wings, which has since been developed into a type which has done splendid work in various theatres of war from seaplane carrying ships. Of the machines which have been produced since the war began it is impossible to give details now, as the whole energies of the firm have been given to supplying the needs of the Navy, but when the time comes that the latest machines designed by Mr. Horace Short can be described, his foresight and originality will be evident.

**A New Zeppelin on Trial.**

REPORTS received in Berne from Constance state that a new and powerful Zeppelin made a trial flight on April 1st. In spite of the rain and low-hanging clouds over Lake Constance, the airship is said to have manoeuvred with great swiftness, vanishing behind the clouds and suddenly re-appearing at quite another point.

**German Balloon in Sweden.**

A LARGE German balloon landed near Cimbrishamn, Sweden, on April 3rd. Four German officers were found on board, and they were taken to Stockholm and interned. They stated that they left Berlin at 3 o'clock that morning for the Eastern front, but the wind changing they landed in Sweden. A large photographic apparatus and a number of maps, which were on board, have been seized.

The late Mr. Horace Short, eight years ago at the Isle of Sheppey aeroplane factory of Messrs. Short Brothers, during the visit of the Wright Brothers to this country. From left to right: Messrs. Orville Wright, Wilbur Wright, Horace Short, and Griffith Brewer.



## SIDE-WINDS.

COPAL varnishes for airscrews and exposed wood parts is a department that the march of aviation has been instrumental in causing to be added to the already lengthy list of varnishes, enamels and fine colours of Wm. Harland and Son, of Merton. Established in 1791, the firm have over a hundred years of experience behind their productions, and a model airscrew which we have received, and which is coated with their special preparation, shows a very high state of finish. "Aeroplane Grey" paint for general covering purposes, which is oil and petrol resisting, is another of their products. All the Harland preparations are under A.I.D. inspection.

MR. HENRY FFISKE, whose marriage is announced, under "Personals," for April 19th, is not without fame in the aircraft industry by reason of the prominent part he has taken in the successful organisation of the aircraft department of Messrs. Boulton and Paul at Norwich. His recent work, which has won for him a seat upon the board of the company, has been the planning of the well thought-out and splendidly equipped factory which the firm have put up for aircraft work, but before the war, although he is still on the sunny side of 30, he had made a reputation as a designer and skipper of speedy motor boats. To his organising ability he brings a vast amount of energy and enthusiasm, while his belief in the old tag of "All work and no play" is shown in the keen interest he takes in the welfare of all B. and P. workers.

WE hear they want more Cellon, and in order to provide it Messrs. Thomas Tyrer and Co., Ltd., who, as is well known, are manufacturers for Cellon, Ltd., have taken bigger premises at Richmond, Surrey, forming a very excellent centre for distribution. Advantage was taken of the Easter holidays to transfer large quantities of raw materials from the old works at Stratford to Richmond, and it is expected that operations at the new works will commence shortly. Under the new conditions the output will, we understand, be many times greater than was the case at Stratford, and when it is mentioned that the output of Cellon during the month of March was a record in the annals of the company, the possibilities of the new works will be appreciated. As hitherto all communications for Messrs. Cellon should be addressed to the head office, Broad Street House, New Broad Street, London, E.C. 2, but in future all empty drums should be returned to Cellon Works, Petersham Road, Richmond, Surrey.



Mr. Geoffrey Ernest ffsike.

THE charming silver models of aeroplanes, made by the Goldsmiths' and Silversmiths' Company, of Regent Street, are works of art, and it was not surprising that Mr. A. T. Isaac, the Chairman of the Company at the annual meeting last week, mentioned that the department which produces them had been exceptionally busy during the past year. Not only does this speak well for the able management of this section of the company's work, but it shows how the careful and accurate workmanship is appreciated. The Chairman also reported a great increase in the sale of wrist-watches, for which the company have won an enviable reputation among military officers.

## COMPANY MATTERS.

Vickers, Ltd.

THE directors of Vickers, Ltd., have issued a circular to the shareholders regretting that, owing to the fact that no settlement of the company's accounts has yet been come to with the Government under the various Acts, it has been found impossible up to now to complete the accounts even for the year 1915, and that it is also necessary for the submission of the accounts for the year 1916 to be delayed. The directors recognise, however, the inconvenience which would be caused to the shareholders if payment of the final dividend for the year ended December 31st, 1916, were postponed, and feel justified in recommending a final dividend, free of income tax, for that period of 1s. 6d. per share, equal to 7½ per cent., free of income tax, on the Ordinary. This, with the interim dividend already paid, will make a total distribution of 2s. 6d. per share, equal to 12½ per cent. for the year, free of income tax.

## CORRESPONDENCE.

"Wanted Employment Agency for Wounded Airmen."

[1935] I have noted Mr. H. J. Lawson's letter in last week's issue of "FLIGHT" with reference to an employment agency for wounded officers of the R.F.C. and R.N.A.S. I shall be only too pleased to receive enquiries from any invalided officer who desires as appointment in the trade, and I may mention that at the moment I am requiring a thoroughly practical gentleman who has a good knowledge of aero-design. I shall be very pleased to be of assistance to Mr. Lawson in furthering his project to the best of my ability.

GEO. H. BETTINSON.

King's Heath Aerodrome, Birmingham, April 4th, 1917.

## PUBLICATIONS RECEIVED.

*Hand Book of Automobiles.* New York: National Automobile Chamber of Commerce, 7E. Forty-second Street.

Catalogue.

*The Simms Magneto.* Simms Motor Units, Ltd., Percy Buildings, Gresse Street, Rathbone Place, W.1.

Index and Title Page for Vol. VIII.

The 8-page Index for Vol. VIII of "Flight" (January to December, 1916) is now ready, and can be obtained from the Publishers, 44, St. Martin's Lane, W.C., Price 6d. per copy, post free.

If you require anything pertaining to aviation, study "FLIGHT'S" "Buyers' Guide and Trade Directory," which appears in our advertisement pages each week.

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